NOAA Technical Report NOS CS 10

DESCRIPTION OF THE OPERATIONAL DATA ACQUISITION AND ARCHIVE SYSTEM (ODAAS) TO SUPPORT THE NOS CHESAPEAKE BAY OPERATIONAL FORECAST SYSTEM (CBOFS)

Silver Spring, Maryland
April 2001

noaa National Oceanic and Atmospheric Administration

U.S. DEPARTMENT OF COMMERCE
National Ocean Service
Coast Survey Development Laboratory
Marine Modeling and Analysis Programs

Office of Coast Survey
National Ocean Service
National Oceanic and Atmospheric Administration
U.S. Department of Commerce

The Office of Coast Survey (CS) is the Nation's only official chartmaker. As the oldest United States scientific organization, dating from 1807, this office has a long history. Today it promotes safe navigation by managing the National Oceanic and Atmospheric Administration's (NOAA) nautical chart and oceanographic data collection and information programs.

There are four components of CS:

The Coast Survey Development Laboratory develops new and efficient techniques to accomplish Coast Survey missions and to produce new and improved products and services for the maritime community and other coastal users.

The Marine Chart Division collects marine navigational data to construct and maintain nautical charts, Coast Pilots, and related marine products for the United States.

The Hydrographic Surveys Division directs programs for ship and shore-based hydrographic survey units and conducts general hydrographic survey operations.

The Navigation Services Division is the focal point for Coast Survey customer service activities, concentrating predominantly on charting issues, fast-response hydrographic surveys and Coast Pilot updates.

NOAA Technical Report NOS CS 10

DESCRIPTION OF THE OPERATIONAL DATA ACQUISITION AND ARCHIVE SYSTEM (ODAAS) TO SUPPORT THE NOS CHESAPEAKE BAY OPERATIONAL FORECAST SYSTEM (CBOFS)

John G. W. Kelley
Meredith Westington
Eugene Wei
Sarah Maxwell
Allison Thomson

April 2001

noaa National Oceanic and Atmospheric Administration

U.S. DEPARTMENT
OF COMMERCE
Donald Evans, Secretary

National Oceanic and
Atmospheric Administration
Scott B. Gudes, Acting Under Secretary

National Ocean Service
Margaret A. Davidson
Acting Assistant Administrator

Office of Coast Survey
Captain David MacFarland

Coast Survey Development
Laboratory
Bruce Parker

NOTICE

Mention of a commercial company or product does not constitute an endorsement by NOAA. Use for publicity or advertising purposes of information from this publication concerning proprietary products or the tests of such products is not authorized.

TABLE OF CONTENTS

LIST OF FIGURES v

LIST OF TABLES vi

LIST OF ACRONYMS vii

1. INTRODUCTION 1

2. INFORMATION REQUIREMENTS FOR NOS ESTUARINE PREDICTION SYSTEMS . . 3
- 2.1. Atmospheric Information 3
  - 2.1.1. Observations 3
  - 2.1.2. Analyses 3
  - 2.1.3. Forecasts 6
- 2.2. Oceanographic Information 7
  - 2.2.1. Observations 7
  - 2.2.2. Analyses 7
  - 2.2.3. Forecasts 7
- 2.3. River Outflow 7
  - 2.3.1. Climatological Data 8
  - 2.3.2. Observations 8
  - 2.3.3. Forecasts 8

3. OVERVIEW OF ODAAS 9
- 3.1. Information Sources 9
- 3.2. Software 9
- 3.3. Documentation 9
- 3.4. Description of Directories 10
- 3.5. Hardware 10
- 3.6. Scheduling 10

4. PROCESSING ETA MODEL OUTPUT 11
- 4.1. Overview 11
- 4.2. NCEP Model Output Files 13
- 4.3. Acquisition and Archiving Shell Scripts and Programs 13
- 4.4. Forecast Sites and Filenames 14
- 4.5. Content of Files 14
- 4.6. Status Files 15
- 4.7. Log Files 15
- 4.8. Display of Output 16
- 4.9. Schedule 16
- 4.10. Troubleshooting 16

5. PROCESSING EXTRA-TROPICAL STORM SURGE MODEL OUTPUT 19
5.1. Overview 19
5.2. NCEP Model Output File 21
5.3. Acquisition and Subsetting Programs 21
5.4. Forecast Sites and Filenames 22
5.5. Content of Files 23
5.6. Status Files 23
5.7. Log Files 24
5.8. Display of Output 24
5.9. Schedule 24
5.10. Troubleshooting 24

6. MONITORING PROCEDURES 27

7. PERMANENT ARCHIVING PROCEDURES 31

8. SOFTWARE MAINTENANCE 31

9. PLANNED ENHANCEMENTS 31

10. ACKNOWLEDGMENTS 32

REFERENCES 33

APPENDIX A: INSTRUCTION FOR CREATING THE MORNING ODAAS STATUS MESSAGE 35

APPENDIX B: INSTRUCTIONS FOR MODIFYING ODAAS' ETA SUBSETTING PROGRAMS TO TAKE INTO ACCOUNT CHANGES IN MODEL RESOLUTION . 37

LIST OF FIGURES

Figure 2.1. A schematic of the inputs, outputs, and components of a NOS 3-D numerical modeling nowcast system. 4

Figure 2.2. A schematic of the inputs, outputs, and components of a NOS 3-D numerical modeling forecast system. 5

Figure 4.1. The structure of the ODAAS subsetted binary file of Eta-22 model forecasts for the Chesapeake Bay region 15

Figure 5.1. Portion of the ETSS model grid domain for the Chesapeake Bay and adjacent coastal waters 19

Figure 5.2. The structure of the ODAAS subsetted text file of ETSS model forecasts for CBBT 23

Figure 6.1. Example of ODAAS Daily Status Message 29

Figure B.1. Sample vector plot of Eta-22 model surface wind velocity analysis for the Middle Atlantic Region. 40

Figure B.2. Locations and I and J grid coordinates for Eta-22 model "filled" native E grid in the Middle Atlantic Region. 41

Figure B.3. Sample vector plot of Eta-22 model surface wind velocity analysis for the Chesapeake Bay region. 43

LIST OF TABLES

Table 4.1. Name and location of Eta-22 model ODAAS Files under the directory: /ODAAS/atmos/fcsts/eta22. 12

Table 4.2. Name and location of Eta-22 model output (00 and 12UTC) on the NCEP IBM SP computer 13

Table 4.3. Directory location, script names, and timing characteristics for Eta-22 model scripts (alias *eta22*) on the CO-OPS SGI workstation. 16

Table 5.1. Name and Location of ETSS model ODAAS Files under the directory: /ODAAS/ocean/fcsts/tdlet/ 20

Table 5.2. Name and location of ETSS model output (00 and 12UTC) on the NCEP IBM SP computer 21

Table 5.3. List of ETSS model forecast site locations for U.S. East Coast 22

Table 5.4. Directory location, script names, and timing characteristics for ETSS model scripts (alias *tdlet*) on the CO-OPS SGI workstation. 24

Table 6.1. Directory location, script names, and execution times of automated ODAAS status message scripts (alias *status*) on the CO-OPS SGI workstation. 27

LIST OF ACRONYMS

AGL	Above Ground Level
ASOS	Automated Surface Observing System
AVN	Aviation Model
AWIPS	Advanced Weather Interactive Processing System
AWOS	Automated Weather Observing System
BUFR	Binary Universal Form for Representing Meteorological Data
CADAS	Centralized Automatic Data Acquisition System
CBBT	Chesapeake Bay Bridge Tunnel
CBOFS	Chesapeake Bay Operational Forecast System
COFS	Coastal Ocean Forecast System
CO-OPS	Center for Operational Oceanographic Products and Services
CORMS	Continuous Operational Real-Time Monitoring System
CSDL	Coast Survey Development Laboratory
C-MAN	Coastal-Marine Automated Network
DCP	Data Collection Platform
DBNet	Distributed Brokered Networking
EDAS	Eta Data Assimilation System
ETSS	Extra-Tropical Storm Surge (Model)
FOS	Family of Services
FTP	File Transfer Protocol
GRIB	GRIdded Binary File Format
HADS	Hydrometeorological Automated Data Systems
IDL	Interactive Data Language
MDL	Meteorological Development Laboratory (formerly TDL)
MLLW	Mean Lower Low Water
NCEP	National Centers for Environmental Prediction
NGM	Nested Grid Model
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NWS	National Weather Service
ODAAS	Operational Data Acquisition and Archive System
OSO	Office of System Development
PUFFF	PORTS Uniform Flat File Format
PORTS	Physical Oceanographic Real-Time System
RFC	River Forecast Center
RUC	Rapid Update Cycle
SBN	Satellite Broadcast Network
SHEF	Standard Hydrometeorological Exchange Format
TDL	Techniques Development Laboratory (see MDL)
TPLM2	NWS Station ID for the Thomas Point Light C-MAN station
WMO	World Meteorological Organization

1. INTRODUCTION

The primary purpose of National Ocean Service's (NOS') Operational Data Acquisition and Archiving System (ODAAS) is to acquire, archive, and subset observations and numerical output from the models operated by the National Weather Service's (NWS') National Centers for Environmental Prediction (NCEP) in Camp Springs, Maryland. ODAAS supports the development and operation of NOS real-time nowcast/forecast systems for estuaries and ports. An experimental version of ODAAS is run by NOS' Coast Survey Development Laboratory (CSDL) and monitored weekdays by CSDL personnel. A portion of ODAAS is maintained on a workstation at the NOS' Center for Oceanographic Products and Services (CO-OPS) to support NOS' Chesapeake Bay Operational Forecast System (CBOFS) (Gross et al., 2000).

ODAAS is composed of UNIX shell scripts and FORTRAN programs which acquire analyses and forecasts from operational and experimental atmospheric and oceanographic forecast models from the NCEP supercomputer. The ODAAS scripts and programs use File Transfer Protocol (FTP) over the NOAA Campus Telecommunication Network.

This technical report provides a description of the version of ODAAS used to support CBOFS at NOS/CO-OPS. The description includes an overview of ODAAS, the procedures for processing the output from the Eta and Extra-Tropical Storm Surge models, discussions on monitoring, archiving, and software maintenance procedures, and planned enhancements. Prior to this discussion, a description is given of the information requirements of NOS estuarine nowcast/forecast systems and how these requirements are being addressed by ODAAS. However, some of these ODAAS capabilities are not presently used by CBOFS, but they may be in the future and so they are presented for completeness. For simplicity, NOS estuarine nowcast/forecast systems will be referred to as estuarine prediction systems in this technical report.

Within this technical report certain naming conventions are used to denote technical information. Names of files and directories are given in bold type set. UNIX commands and usage statements are enclosed in single quotes and given in Courier font face.

2. INFORMATION REQUIREMENTS FOR NOS ESTUARINE PREDICTION SYSTEMS

The numerical and statistical estuarine prediction systems being developed and implemented by NOS require real-time or near-real-time observations and analyses, and short-term forecasts of atmospheric, oceanographic, and river variables (Figures 2.1 and 2.2). This information is used for specifying surface and lateral boundary conditions for NOS estuarine prediction systems. The different types of information are briefly discussed in the following sections.

2.1. Atmospheric Information

NOS estuarine prediction systems require analyses and forecasts of surface wind stress on a grid to provide surface boundary conditions. In the future, these systems may also require analyses and forecasts of surface heat and moisture fluxes.

2.1.1. Observations

The creation of analyses of surface heat flux on the estuarine model native grid requires the interpolation of hourly or more frequent surface weather observations and cloud cover. The generation of analyses of surface wind velocity or stress requires observations of wind direction and speed. Moisture flux estimation requires estimates of precipitation and evaporation. Precipitation can be estimated from surface weather observations of rainfall amounts via rain gauges or NWS Doppler weather radars.

Surface weather observations are available over NOAAPORT Satellite Broadcast Network (SBN), NWS' and NOS' FTP servers, and also from the observation files on NCEP supercomputers. Presently, only observations from NOS Physical Oceanographic Real-Time System (PORTS) stations in Chesapeake Bay and the National Data Buoy Center (NDBC) Thomas Point Lighthouse Coastal-Marine Automated Network (C-MAN) station (TPLM2) are stored in the ODAAS directories. These observations are not obtained by ODAAS scripts, but rather by scripts associated with CBOFS and CO-OPS. The NOS observations are in PORTS Uniform Flat File Format (PUFFF) format and are overwritten every 6 minutes in the ODAAS directory: **/ODAAS/atmos/obs/nos/recent**. The TPLM2 observations are located on the CBOFS workstation in the directory: **/CBOFS/data/OSO/TPLM2/YYYYMM**.

2.1.2. Analyses

Gridded analyses of surface wind stress and heat flux can be obtained in two ways: 1) interpolation of gridded surface flux analyses from an atmospheric model's data assimilation system to the model grid of the estuarine prediction system or 2) calculation of surface fluxes from gridded meteorological fields of data analysis or assimilation systems.

Analyses of surface fluxes and meteorological fields are available from NCEP's Eta Data Assimilation System (EDAS) and Rapid Update Cycle (RUC). EDAS analyses are available at 3-h intervals at a horizontal resolution of 22 km for North America and coastal waters. RUC analyses are available at 1-h intervals at a horizontal resolution of 40-km over contiguous United

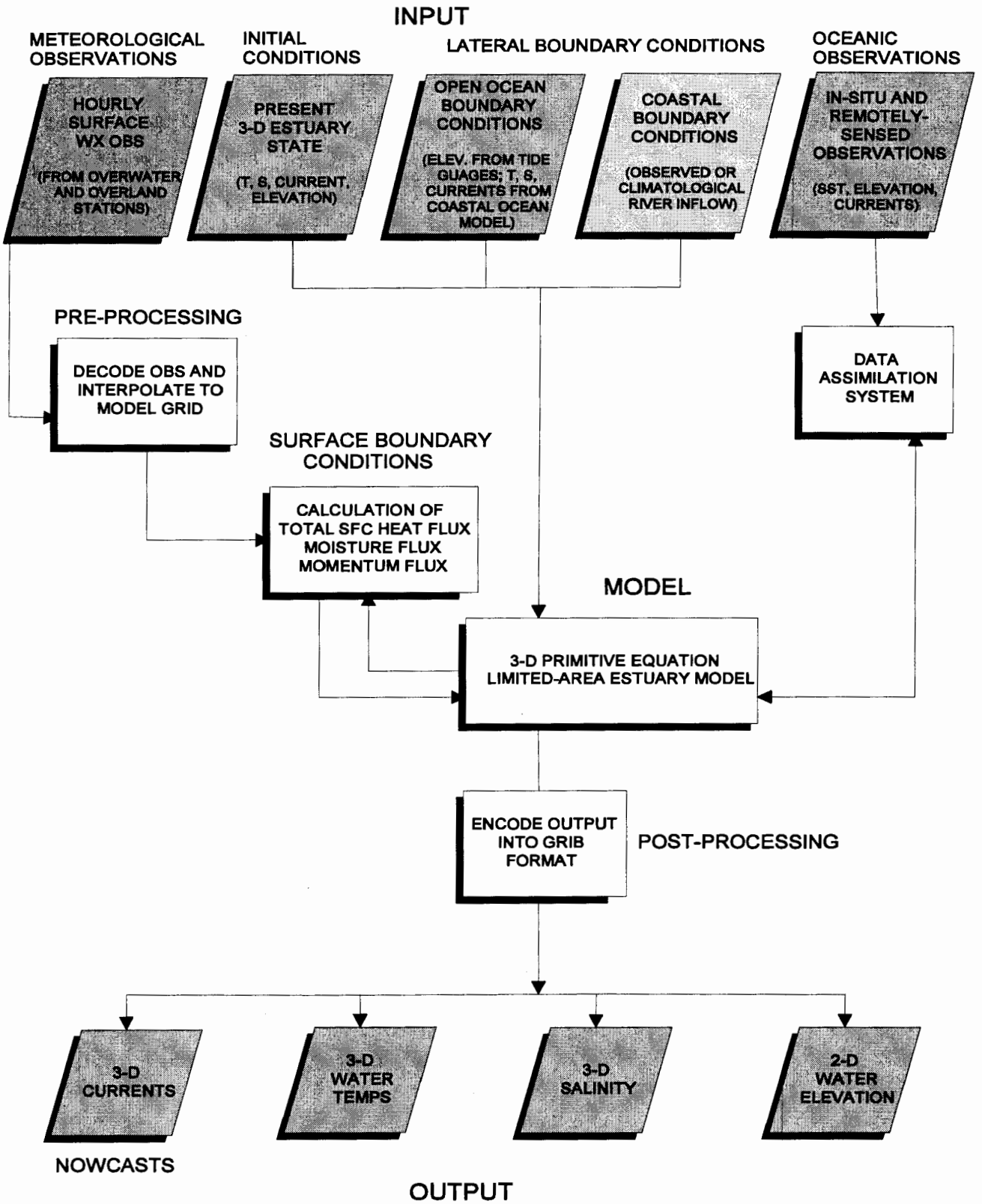

Figure 2.1. A schematic of the inputs, outputs, and components of a NOS 3-D numerical modeling nowcast system.

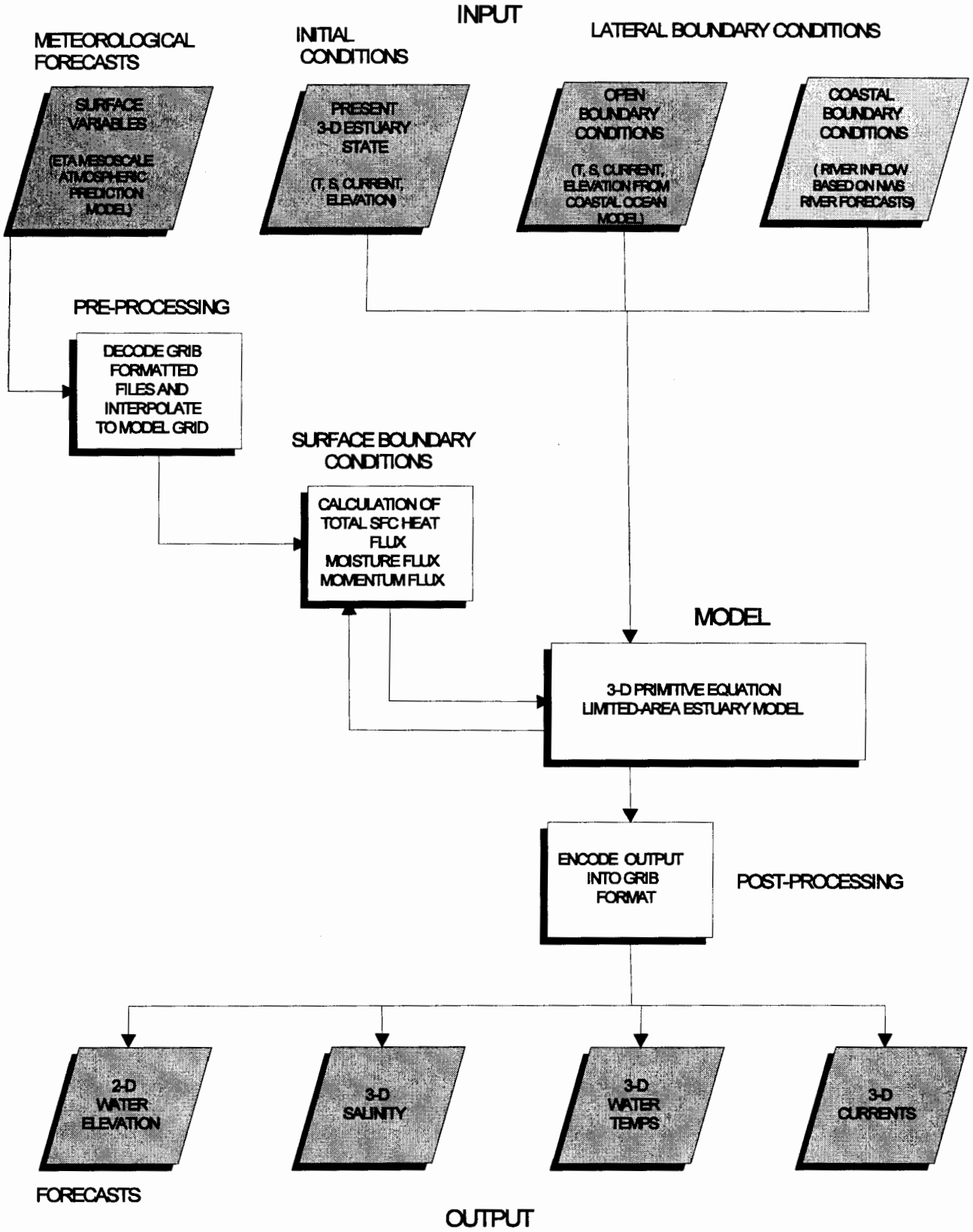

Figure 2.2. A schematic of the inputs, outputs, and components of a NOS 3-D numerical modeling forecast system.

States and immediate coastal waters.

With these analyses, a NOS developer can calculate surface heat flux and wind stress via the two methods described earlier; however, the EDAS analyses do not contain precipitation analyses. The best substitution for a precipitation analysis would be to acquire the EDAS 3-h or RUC 1-, 2-, or 3-h forecasts of precipitation or estimate of precipitation amounts based on NWS weather radar reflectivities.

Presently, the current operational version of CBOFS does not use analyses from NCEP modeling systems. Instead, CBOFS linearly interpolates hourly surface wind observations from TPLM2 and the NOS station at the Chesapeake Bay Bridge Tunnel (CBBT) to the CBOFS' model grid. Additional information can be obtained from Gross et al. (2000).

2.1.3. Forecasts

Similar to the analyses, short-term forecasts of surface wind stress and heat flux can be obtained by the following two methods: 1) interpolation of gridded surface flux forecasts from the atmospheric models to the model grid of the estuarine forecast system or 2) calculation of surface fluxes from gridded meteorological forecast fields.

Gridded analyses of surface fluxes and meteorological fields are available from the NCEP global spectral atmospheric short-term prediction model (commonly referred to as the 'Aviation Model') and Eta Mesoscale Atmospheric Prediction Model. The Aviation Model has an equivalent horizontal grid resolution of 105 km. There are four cycles of the Aviation Model per day, occurring at 0000, 0600, 1200, and 1800 UTC. The 0000 and 1200 UTC cycles produce forecasts out to 126 hours, while the 0600 and 1800 UTC cycles generate forecasts to 84 hours.

Eta-22 model forecast fields are available at 3-h intervals at a horizontal resolution of 22 km for North America and coastal waters. This version of the Eta model is commonly referred to as the Eta-22 model. There are four cycles of the Eta-22 model per day, at 0000, 0600, 1200, and 1800 UTC. The 0000 and 1200 UTC cycles produce forecasts out to 60 hours while the 0600 and 1800 UTC cycles generate forecasts out to 48 hours. Other NCEP atmospheric forecast models which could provide short-range surface fluxes and/or meteorological fields are the Nested Grid Model (NGM) and RUC. The NGM provides 48-h forecasts for North America and adjacent waters. The RUC generates 3- to 12-hour forecasts for the contiguous United States and immediate coastal waters at a 40-km horizontal resolution.

With these forecasts, a NOS developer can calculate surface heat flux and wind stress via either of the two methods described earlier. In addition, the Eta-22, NGM, and Aviation models generate precipitation forecasts which could be used in the calculation of surface moisture flux.

Presently, ODAAS acquires output from the 0000 and 1200 UTC cycle of the Eta-22 model for use by CBOFS.

2.2. Oceanographic Information

2.2.1. Observations

The generation of nowcasts by NOS estuarine model prediction systems requires water level observations from NOS' water level gauge stations and Physical Oceanographic Real-Time System (PORTS) stations near the open boundaries of the estuarine prediction systems. Presently, NOS observations are obtained from CO-OPS by each developer separately. The PORTS observations are formatted in the NOS PORTS Uniform Flat File Format (PUFFF) (Evans et al., 1998).

In the future, these estuarine prediction systems will require real-time observations of water temperature, currents, and salinity for forcing at their open boundaries, and for possible assimilation into the models. PORTS could provide this information in real-time.

2.2.2. Analyses

In the future, NOS estuarine prediction systems may extend beyond the mouth of an estuary and into the coastal ocean. This would require information along an extensive boundary which could not be provided by distant observation sites on the coast. The open boundary conditions could be provided by climatology or by real-time analyses or nowcasts from coastal ocean prediction systems, such as NOAA's experimental Coastal Ocean Forecast System (COFS). Although available, ODAAS does not presently acquire three-dimensional nowcasts from COFS.

2.2.3. Forecasts

In order to generate forecasts, the NOS estuarine prediction systems presently require hourly forecasts of either subtidal or total water level on or near the open boundary. ODAAS obtains subtidal water level point forecasts from the NWS Meteorological Development Laboratory's (previously called the Techniques Development Laboratory) (MDL's) Extra-Tropical Storm Surge (ETSS) Model. The ETSS model generates 48-h forecasts of subtidal water level at various locations along the East Coast and Gulf of Mexico twice a day at 0000 and 1200 UTC. Hourly forecasts of total water levels are also available from COFS. COFS has one forecast cycle per day at 0000 UTC which generates 24-h forecasts of total water level at locations along the East Coast.

In the future, NOS estuarine systems may forecast for temperature, salinity, currents and their grid domain may be extended beyond the mouth of an estuary and into the coastal ocean. The model's open boundary condition would require short-term forecasts along an extensive boundary which could not be provided by distant forecast points on the coast. The alternative would be to use forecasts from coastal ocean prediction systems, such as COFS. Although gridded forecasts of temperature, salinity, and currents are available, ODAAS does not presently acquire three-dimensional forecast fields from COFS.

2.3. River Outflow

NOS estuarine prediction systems may also require information on river and sewage outflow in the

future. At NOS/CSDL, river information has been based on 1) monthly mean based on historical data, 2) near-real-time observations, and/or 3) NWS river forecast guidance. The different types of river information are discussed below. A detailed description about the river information and the requirements of NOS estuarine forecast systems can be found in Thomson (2000).

2.3.1. Climatological Data

Information on mean monthly or annual outflow is available from most major rivers in the United States. CBOFS uses monthly mean river flow for the Susquehanna, Chester, Choptank, Nanticoke, Patuxent, Potomac, Rappahanock, York, and James Rivers.

2.3.2. Observations

It will be important for NOS estuarine prediction systems to use real-time observations of river flow rates or estimates based on river stage, especially in situations of high flows following heavy rains during tropical or extra-tropical cyclones, mesoscale convective systems, or in cases of low flows during a drought. Near-real-time river observations are available from the U.S. Geological Survey, from NWS' Regional River Forecast Centers (RFCs), or from the NWS Office of System Operations (OSO).

RFCs receive data from the gauges in a variety of ways. Most gauges have Geostationary Operational Environmental Satellite (GOES) Data Collection Platform (DCP) telemetry and transmit their data every hour typically (R. Shedd, personal communication, 1999). These data are processed into a Standard Hydrometeorological Exchange Format (SHEF) message by the Hydrometeorological Automated Data Systems (HADS) processor at the Office of Hydrology in Silver Spring, Maryland and transmitted via the NOAAPORT SBN under the WMO header SRUS20 KWOH. Alternatively, a smaller portion of the gauges have telephone interrogable units. Some of these data are also processed by the Centralized Automatic Data Acquisition System (CADAS) and HADS and distributed in the same product (R. Shedd, personal communication, June, 1999).

These data are available via NOAAPORT SBN, the OSO FTP servers, the appropriate NWS RFC, and the USGS Web page. Presently, ODAAS at CO-OPS does not acquire river observations.

2.3.3. Forecasts

NOS estuarine prediction systems may also benefit from NWS short-term forecasts of river outflow, especially in situations of rapidly changing conditions in the hours or days following heavy rains or during a drought. Short-term river predictions can be obtained from forecast guidance generated by river forecast models operated at the RFCs. The forecasts are usually made once a day before Noon local time and at 6-hour intervals out to 54 hours. The forecast guidance includes the observed river stage at 1200 UTC. However, in flood or near-flood conditions, the guidance may be updated up to four times per day. Presently, ODAAS at CO-OPS does not acquire river forecast guidance.

3. OVERVIEW OF ODAAS

Descriptions of the data sources, software, hardware, and scheduling procedures are given in this section. Directories and file names are shown in bold typeset. UNIX commands and usage statements are enclosed in single quotes and given in Courier font face.

3.1. Information Sources

The primary source of data archived by ODAAS is the NCEP IBM System Parallel (commonly referred to as the IBM SP) supercomputer located at the Commerce Department's Census Bowie Computer Center in Bowie, Maryland. Output from NCEP operational models is located on the IBM SP in operational subdirectories of the directory: **/com**. The subdirectories are named according to the modeling system. For example, the subdirectory containing output from the Eta atmospheric forecast model is named **eta**. It is anticipated that ODAAS will acquire NCEP model output from NCEP data servers in mid-2001 due to changes in NCEP policies regarding access to NCEP computers by other NOAA agencies.

3.2. Software

ODAAS uses a variety of software sources to acquire, archive, translate, and subset NCEP model output. Both C and Bourne UNIX shell scripts and FORTRAN 77 programs are used to acquire and subset the data. ODAAS relies on the NCEP Gridded Binary (GRIB) decoder, wgrib, for extracting specific GRIB records within a NCEP model output GRIB file and for degribbing the GRIB records into ASCII or traditional binary format (e.g. IEEE binary). Additional information on wgrib and GRIB can be found the http://www.ncep.noaa.gov and ftp://wesley.wwb.noaa.gov/pub/wgrib. Presently, ODAAS obtains model output from NCEP via FTP "pulls"; however, it is anticipated that by mid-2001, NCEP's Distributed Brokered Networking (DBNet) software will be incorporated into ODAAS to obtain model output from the NCEP data servers.

3.3. Documentation

All ODAAS shell scripts and FORTRAN programs include documentation blocks located at the beginning of the main sections of each program and subroutines. Originally, these documentation blocks were based on those used by NCEP (Peters, 1998) which included the following information: Program Name, Purpose, Contact Person(s), Attributes (language, computer system), Programs Called, Input Files, Output Files, and History; however, the blocks were changed to meet NOS/CO-OPS standards. The CO-OPS documentation blocks include the following information: Program Name, Program Location, Technical Contact, Author, Date, Revisions (Date, Author, Reason), Abstract, Language, Target Computer, Equation Used, Program Execution, Input Parameters, Stored Procedures, Tables, Subroutines or Functions Called (Name, Location, Description), Input Files (Unit No., Name, Location, Description), Output Files (Unit No., Name, Location, Description), Libraries Used, Error Conditions, and Remarks (J. Nault, personal communication, 1999). In addition, an effort has been made to include comments within the code to identity major tasks performed by the program.

3.4. Description of Directories

The Eta and ETSS model directories include the following sub-directories: **archives** (data), **exec** (FORTRAN executables called by the scripts), **execlog** (log files created when a script is executed/completed), **idl** (IDL graphics programs/images associated with the model), **info** (information about the model or grid), **scripts** (operational and manual UNIX scripts), and **sorc** (FORTRAN source code). There is also a **modlog** file in each model directory. This file is updated by the ODAAS staff when any changes are made to the script, log files, etc. Detailed directory and file information for the Eta and ETSS models is given in Sections 3 and 4, respectively.

3.5. Hardware

Presently, the version of ODAAS used to support CBOFS is run on the CO-OPS SGI workstation located at CO-OPS in Room 6247 of SSMC4. It is anticipated that ODAAS will also be ported to a backup CBOFS server at CO-OPS.

3.6. Scheduling

The scripts responsible for acquiring and processing Eta and ETSS model output from NCEP are scheduled using the UNIX command '`crontab`'. The scripts are designed to sleep for 15 minutes if the model output is not present on the specified directories at the NCEP IBM SP computer. The scripts are identified by the UNIX '`crontab`' command file called **cronodaas** to be executed automatically. This file is located under the directory **/ODAAS**. For a script to be executed via the **cronodaas** file, the entry must contain the time of execution, full directory path, and be directed either to an output file or to **/dev/null** (trash). To display the contents of **cronodaas** to the screen from any ODAAS directory, simply type the UNIX command '`crontab -l`'.

4. PROCESSING ETA MODEL OUTPUT

4.1. Overview

The Eta atmospheric forecast model is NCEP's primary short-range forecast model for North America. It has 22km horizontal resolution with 50 vertical eta layers and uses a silhouette-step topography. Eta employs the semi-staggered Arakawa E grid. There are four cycles of the Eta-22 model per day at 0000, 0600, 1200 and 1800 UTC. The 0000 and 1200 UTC forecast cycles produce 3 hourly forecasts out to 60 hours. These cycles take approximately 2 hours to run on the IBM SP. Output from the Eta-22 model is available on its native E grid and also interpolated to NWS' Advanced Weather Information Processing System (AWIPS) output dissemination grids. Additional information on Eta can be found in Black (1994), Staudenmaiser (1996), and Rogers et al. (1997).

ODAAS obtains and archives output from the 0000 and 1200 UTC forecast cycles of Eta on its native E grid. Output on Eta's original native grid is used to minimize the propagation of interpolation errors which may have occurred in the interpolation of Eta output from the native to the NWS' AWIPS output grids. A table outlining the UNIX scripts, subsetting FORTRAN programs, status files, and log files related to the processing of Eta model output is given in Table 4.1.

Table 4.1. Name and location of Eta-22 model ODAAS Files under the directory: **/ODAAS/atmos/fcsts/eta22**.

ODAAS DIRECTORY	FILENAMES	DESCRIPTION
.../archives	/YYYYMM/cb/ YYYYMMDDHHeta22.cb.bin	Subsetted Eta model output for Ches. Bay region (bin format)
	/YYYYMM/domain/ YYYYMMDDHHeta22.grb	Eta model output for entire Eta grid domain (GRIB format)
.../exec	obtain-eta-latlon.ex	FORTRAN executable to get lat/lon
	subset-cbay-eta22.ex	FORTRAN executable to subset Eta output for Ches Bay region
.../execlog	get_HHz.log	Log file of screen output during eta22_HHz.sh run
	eta22_HHz.ftpgrb.log	Combined log file of FTP process, degribbing process, and extraction process
	eta22_HHz.subset.log	Log file of subsetting process
	eta22_HHz.subset.status.cb	Status file of subsetting process of the Chesapeake Bay
../info	eta22-lat-cb.2d eta22-lon-cb.2d	Lat/lon coordinates of Eta grid points for subsetted Chesapeake Bay region
	eta22-lat-domain.2d eta22-lon-domain.2d	Lat/lon coordinates of Eta grid points for the full domain
.../scripts	eta.awk	UNIX awk script called by eta22.sh
	eta22.sh	Primary, interactive UNIX script to process Eta-22
	eta22_HHz.sh	UNIX date/time script that sends parameters to eta22.sh
	eta22_HHz.acquire.ftp	FTP parameters script called by eta22.sh
	run-obtain-eta-latlon.sh	UNIX lat/lon script
.../sorc	etamodelparams.h	Include file of Eta model parameters
	makeobtain	Makefile for compiling obtain-eta-latlon.f
	makesubsetcbay	Makefile for compiling subset-cbay-eta22.f
	obtain-eta-latlon.f	FORTRAN program to obtain lat/lon coordinates
	subset-cbay-eta22.f	FORTRAN program to subset Eta model output for Chesapeake Bay region

4.2. NCEP Model Output Files

The Eta model native grid output files are located on the IBM SP in the operational directory: **/com/eta/prod/eta.YYYYMMDD** (Table 4.2). The output are stored in files at 3 hourly intervals. The files are named using the convention: **eta.tHHz.egrdsfXX.tm00**, where HH represents the cycle hour (00 or 12) and XX represents the forecast projection. Thus, there are files covering the period from 0 to 48 or 60 hours, depending on the cycle. The abbreviations z indicates UTC, egrdsf refers to surface (sf) output on the native E-grid (egrd) used by the Eta model, and tm00 stands for "time minus 00 hours" indicating the number of hours prior to launch time of the model cycle. The files are in GRIB format.

Table 4.2. Name and location of Eta-22 model output (00 and 12UTC) on the NCEP IBM SP computer, where YYYY is year, MM is month, DD is calendar day, and XX is forecast projection hour ([1] based on NCEP's estimation as of January 16, 2001. Changes can be found at http://www.ncep.noaa.gov.)

NCEP Computer	NCEP DIRECTORY PATH AND FILE NAME	NCEP DELIVERY TIME (UTC)[1]
IBM SP	com/eta/prod/eta.YYYYMMDD/eta.t00z.egrdsfXX.tm00	0300
	com/eta/prod/eta.YYYYMMDD/eta.t12z.egrdsfXX.tm00	1502

4.3. Acquisition and Archiving Shell Scripts and Programs

The ODAAS shell script **eta22.sh** is the central processing script for Eta model output. The UNIX script performs the following tasks:

1) acquires GRIB files
2) executes a NCEP grib utility program to extract specified output variables
3) executes the grib utility program, wgrib, to degrib the specified output
4) executes the FORTRAN program to subset degribbed output for the geographic region covering the CBOFS domain.

Eta22.sh is a command line, interactive script which requires input parameters for year, month, calender day, day in year, and cycle (00 or 12). **Eta22_00z.sh** and **eta22_12z.sh** contain the cycle and date/time input parameters for **eta22.sh**. These parameter scripts are launched via the UNIX '`crontab`' command at specific times each day and call **eta22.sh** (see Schedule section 4.9).

The subsetting FORTRAN executable for the Chesapeake Bay is **subset-cbay-eta22.ex** and can be found in the directory: **/ODAAS/atmos/fcsts/eta22/exec**. The source code, **subset-cbay-eta22.f**, is located in the directory: **/ODAAS/atmos/fcsts/eta22/sorc**. Input for the

program is the degribbed Eta output for the entire Eta domain.

4.4. Forecast Sites and Filenames

The GRIB files containing the extracted Eta forecast variables are named using the convention **YYYYMMDDeta22.grb**, where YYYY is the year, MM is the month, and DD is the calendar day. These files contain forecasts from both the 0000 and 1200 UTC cycles and are located in the directory: **/ODAAS/atmos/fcsts/eta22/archives/YYYYMM/domain**.

The binary files of subsetted output for the Chesapeake Bay region are named using the convention **YYYYMMDDCCeta22.cb.bin**, where CC is the model cycle hour (UTC) and cb indicates the Chesapeake Bay. The binary files of subsetted output are located in the directory: **/ODAAS/atmos/fcsts/eta22/archives/YYYYMM/cb**.

4.5. Content of Files

The GRIB file contains the following variables: surface pressure, mean sea level pressure, potential temperature (10m above ground level [AGL]), air temperature (2m AGL), specific humidity (2m AGL), specific humidity (10m AGL), u- and v-components of surface (10m AGL) wind velocity, friction velocity, downward short wave radiation flux, upward short wave radiation flux, downward long wave radiation flux, upward long wave radiation flux, sensible heat flux, latent heat flux, total cloud cover, and accumulated precipitation. The GRIB files contain these variables for the entire Eta-22 model domain.

The degribbed/subsetted Eta-22 files for the Chesapeake Bay region contain only u- and v-components of the surface (10 m AGL) wind and the mean sea-level pressure from 0- to 48-hr at 3 hour intervals. These three variables are required for forcing CBOFS forecast cycles. The structure of the ODAAS-generated forecast files for the Chesapeake Bay region is given in Figure 4.1.

IMODEL, IGRID
IYR_1, $IMON_1$, $IDAY_1$, $IHOUR_1$, $IMIN_1$, $IPROJ_1$ U10(I=1,IMET,J=1,JMET) V10(I=1,IMET,J=1,JMET) MSLP(I=1,IMET,J=1,JMET)
IYR_2, $IMON_2$, $IDAY_2$, $IHOUR_2$, $IMIN_2$, $IPROJ_2$ U10(I=1,IMET,J=1,JMET) V10(I=1,IMET,J=1,JMET) MSLP(I=1,IMET,J=1,JMET)
IYR_3, $IMON_3$, $IDAY_3$, $IHOUR_3$, $IMIN_3$, $IPROJ_3$ U10(I=1,IMET,J=1,JMET) V10(I=1,IMET,J=1,JMET) MSLP(I=1,IMET,J=1,JMET)
⋮
IYR_{48}, $IMON_{48}$, $IDAY_{48}$, $IHOUR_{48}$, $IMIN_{48}$, $IPROJ_{48}$ U10(I=1,IMET,J=1,JMET) V10(I=1,IMET,J=1,JMET) MSLP(I=1,IMET,J=1,JMET)

Figure 4.1. The structure of the ODAAS subsetted binary file of Eta-22 model forecasts for the Chesapeake Bay region, where IMODEL is the model number (89 for Eta-22 model), IGRID is the model grid number (94 for Eta-22 model), IMET is the number of rows in the subsetted Chesapeake Bay region (22), JMET is the number of columns in the subsetted Chesapeake Bay region (35), U10 is the u-component of the surface (10m AGL) wind velocity, m s^{-1}, V10 is the v-component of the surface (10m AGL) wind velocity, m s^{-1}, and MSLP is the mean sea-level atmospheric pressure, Pa.

4.6. Status Files

The status files for the Chesapeake Bay region indicating whether or not the subsetting was successful can be found in the directory: **/ODAAS/atmos/fcsts/eta22/execlog**. The files are named using the convention: **eta22_HHz.subset.status.cb**, where cb indicates the Chesapeake Bay region and HH indicates the cycle hour (00 or 12). Each file contains one line consisting of six fields: a flag indicating success (1) or failure (0), the year, month, calendar day, day in year, and cycle time (0000 or 1200).

4.7. Log Files

There are three log files for use by persons responsible for monitoring ODAAS. The file **eta22_HHz.ftpgrb.log** is a combined log of the following actions: the FTP process between CO-OPS and NCEP computers, the extraction of surface variables from the original Eta GRIB files,

and the degribbing of selected surface variables. The log file **eta22_HHz.subset.log** records the subsetting process for the Chesapeake Bay. The file **get_HHz.log** is a log of the screen output generated as **eta22_HHz.sh** is launched from the UNIX '`crontab`' command. All of these files are located under the directory: **/ODAAS/atmos/fcsts/eta22/execlog**.

4.8. Display of Output

Maps of 3-hly surface wind forecasts over Chesapeake Bay region from the 0000 and 1200 UTC cycles can be plotted using CSDL's IDL graphics programs. The UNIX scripts which generate the IDL programs for plotting winds from the 0000 UTC cycle are **plot-eta22-00z-cb-winds-ps.csh** and **plot-eta22-00z-cb-winds-gif.csh**. A similar set of scripts exists for plotting the wind forecasts from the 1200 UTC cycle. These scripts are available from CSDL.

4.9. Schedule

The scripts **eta22_00z.sh** and **eta22_12z.sh** are scheduled to execute via a UNIX '`crontab`' command file at the times given in Table 4.3. These times were set based on the anticipated completion times of Eta model postprocessing on NCEP's IBM SP. The latest information on the expected completion times of Eta and other NCEP models can be found at http://www.ncep.noaa.gov/NCO/PMB/nwprod/prodstat/.

The scripts use the UNIX '`sleep`' command in case the completion of the Eta model is delayed at NCEP. The '`sleep`' time parameter is set to 900 seconds (15 minutes) and will execute until a designated maximum hour is reached. No further attempts to acquire data from NCEP will be tried after the '`sleep`' command cutoff times given in Table 4.3.

Table 4.3. Directory location, script names, and timing characteristics for Eta-22 model scripts (alias *eta22*) on the CO-OPS SGI workstation.

ODAAS DIRECTORY *ALIAS: eta22*	**AUTO SCRIPT**	**TIMING CHARACTERISTICS**			**MANUAL SCRIPT**
		Launch Time (UTC)	***Sleep Period* (sec)**	***Sleep Cutoff (UTC)***	
/ODAAS/atmos/fcsts/eta22/scripts	eta22_00z.sh	0310	900	1100	eta22.sh
/ODAAS/atmos/fcsts/eta22/scripts	eta22_12z.sh	1545	900	2100	eta22.sh

4.10. Troubleshooting

Occasionally, the ODAAS scripts fail to acquire the Eta-22 model files. Commonly, these failures may be due to a lack of model output at NCEP possibly because the model was run late or canceled, a communication problem occurred between NCEP and NOS, or an abrupt, unscheduled

change happened in file naming conventions at NCEP. The following describes some troubleshooting procedures to help identify and react to problems with Eta model acquisition.

Eta model problems are normally recognized by the Automated ODAAS Status Report (see Monitoring Procedures, Section 6). The automated message scripts are launched twice a day for the 0000 UTC and 1200 UTC cycles. As the scripts check for the presence of Eta model output at CO-OPS, three message types for the Eta-22 model may be displayed in the ODAAS log file.

(1) ETA-22 GRIB file appears to be of sufficient size

If this message appears then the full domain Eta-22 model GRIB file was received properly at CO-OPS. This message can be confirmed by inspecting the GRIB file size in bytes which should be approximately 90MB.

(2) ETA-22 GRIB file of extracted sfc variables is too small. Check whether ETA-22 model is late in execution or network problem

This message occurs if the number of bytes calculated for the full domain GRIB file is less than 89MB. Possible causes could be that network connections were lost between NCEP and CO-OPS during the FTP process or there is a lack of disk space at CO-OPS to store the full file.

To check disk space at CO-OPS use the UNIX command '`df .`'. If the space listed is more than 95% occupied, then room should be made for the new Eta-22 output. As a general rule when removing Eta-22 model files, at least 2 days of Eta-22 model full domain GRIB files should be kept online and at least 3 months of Eta-22 model subsetted BIN files should remain. Removing extraneous domain GRIB files should be the first priority due to their large file sizes.

To investigate any failures in the FTP process, it is a good idea to check the FTP log file, **eta22_HHz.ftpgrb.log**, located under the directory: **/ODAAS/atmos/fcsts/eta22/execlog**.

In order to retrieve the full domain GRIB file and the Chesapeake Bay subsetted BIN file, one will need to re-run the script **eta22_HHz.sh**, where HH is the needed cycle time. If more than a day has passed since the missing data was noticed, it is possible to run **eta22.sh** followed by date arguments to retrieve the complete files. It is a good idea to create backups of the partial Eta-22 model files before beginning these tasks.

(3) *** FILE DOES NOT EXIST!! ***

This message occurs if the Eta-22 model GRIB file, **YYYYMMDDCCeta22.grb**, where YYYY is the year, MM is the month, DD is the day, and CC is the cycle time, is not present in the Eta-22 model archives directory. Possible causes include blocked communications with NCEP, the UNIX '`crontab`' command did not launch the Eta-22 model retrieval script, or the model output is not available at NCEP.

In order to pinpoint the cause for the missing model output, there are several sources to contact. The first source is NCEP itself. By navigating to the Eta-22 model production directory on the computer at NCEP, one can determine whether the files exist for retrieval (see Table 4.2).

To investigate ODAAS script problems the log files should be checked. The log file **get_HHz.log**, where HH is the cycle time, contains all screen output and may contain useful UNIX error messages, such as flags for timed out processes or files not being created. The log file **eta22_HHz.ftpgrb.log**, where HH is the cycle time, shows whether FTP communications were established to NCEP or if the process paused properly using the UNIX '`sleep`' command. The

log file **eta22_HHz.subset.log**, where HH is the cycle time, shows whether ODAAS' FORTRAN programs properly functioned in order to subset the full domain file.

In summary, when troubleshooting for Eta-22 model, it is best to

- Determine whether the file exists at NCEP and check SDM messages and/or the NCEP/NCO Web page for delay notices from NCEP (see Monitoring Procedures Section 6 for Internet address)
- Determine whether the ODAAS UNIX script is still an active process on the CO-OPS workstation by using the command. Usage:

  `'ps -u cbcaster'`

  If the model output is available at NCEP and the script is still running, it is best to let it finish. As defined in the UNIX '`sleep`' command, every 15 minutes the script **eta22.sh** will ping NCEP and attempt to retrieve the Eta-22 model files.
  If the output is not available and the script is paused indefinitely by the UNIX '`sleep`' command, you may need to stop the script by using the UNIX '`kill`' command with the process IDs (PID) for **eta22_HHz.sh** and **eta22.sh**. Usage:

  `'kill PID'`

  The script should eventually stop when it reaches the designated sleep cutoff hour (see Table 4.3), so this step may not be necessary.
- Finally, if Eta-22 model output is available, but cannot be obtained and processed by running the script **eta22.sh** manually, then ODAAS personnel at CSDL should be contacted.

5. PROCESSING EXTRA-TROPICAL STORM SURGE MODEL OUTPUT

5.1. Overview

ODAAS obtains hourly, subtidal water level forecasts from the two daily cycles of NWS MDL's ETSS Model (Chen et al., 1993). The ETSS model's surface forcing is provided by NCEP's Aviation Model, a global spectral atmospheric prediction model. The East Coast version of the ETSS model forecasts hourly subtidal water levels out to 48 hours at 60 locations along the U.S. East Coast, including at the NOS water level station at CBBT (Figure 5.1). ETSS' water levels are referenced to mean sea level, not Mean Lower Low Water (MLLW).

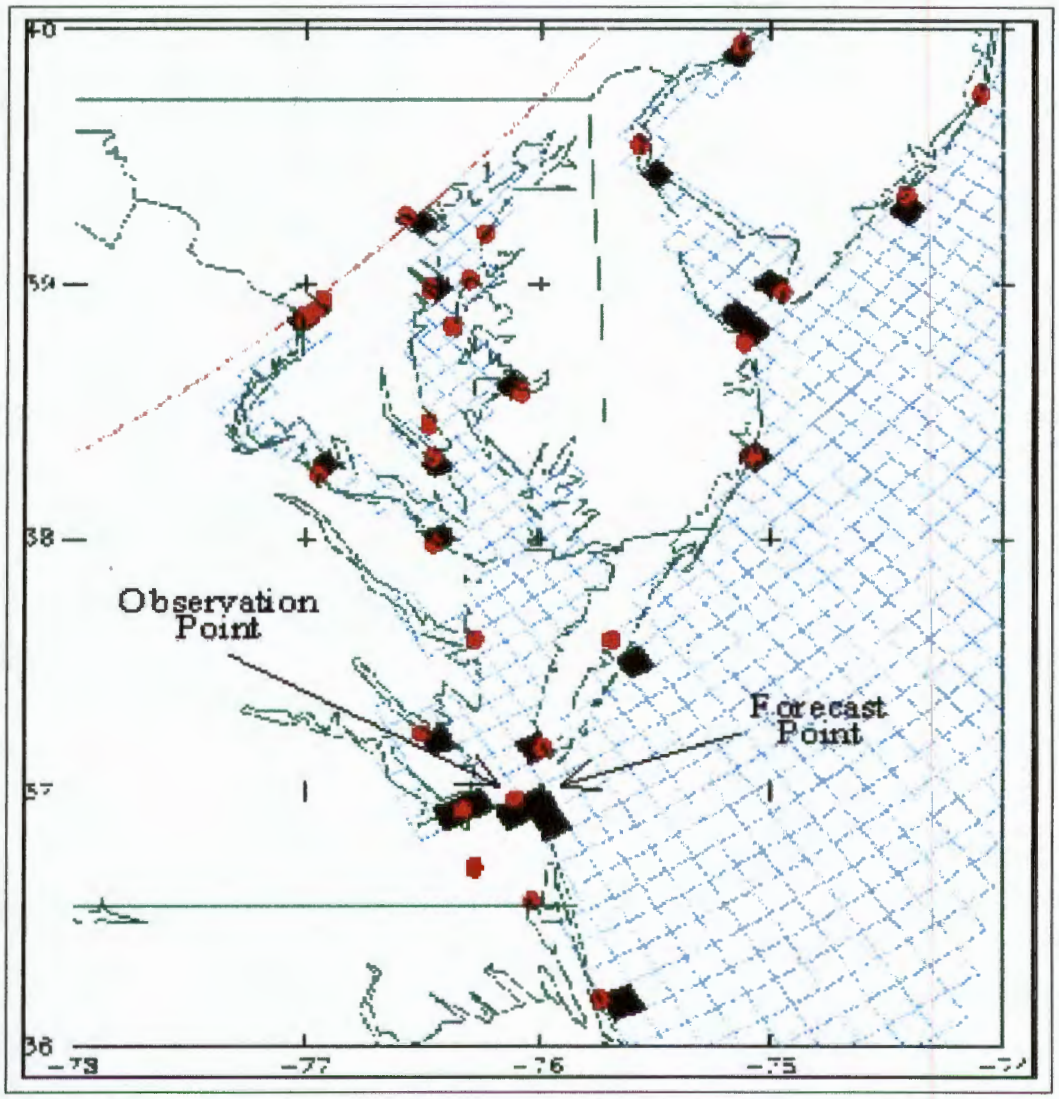

Figure 5.1. Portion of the ETSS model grid domain for the Chesapeake Bay and adjacent coastal waters. Points represent NOS water level gauges, and squares represent model forecast points. CBBT observation and forecast points are indicated.

ODAAS acquires the forecast output from NCEP, creates an individual file for CBBT, and archives both the original, ETSS model output file for the East Coast and the CBBT file. The individual file is more convenient for use by CBOFS. An outline of the scripts, subsetting program, status files and log files is given in Table 5.1.

Table 5.1. Name and Location of ETSS model ODAAS Files under the directory: **/ODAAS/ocean/fcsts/tdlet/**.

ODAAS DIRECTORY	FILENAMES	DESCRIPTION
.../archives	/YYYYMM/cbbt/ YYYYMMDDHH.cbbt	Archive of ETSS model forecasts for CBBT site
	/YYYYMM/ec/ YYYYMMDDHH.ec	Archive of ETSS model East Coast forecasts
	/recent/	Contains recent ETSS model forecasts for CBBT
.../exec	reformat_tdlet_ec.x	FORTRAN executable to subset East Coast file
.../execlog	get_HHz.log	Log file of screen output during tdlet_HHz.sh run
	tdlet_HHz.acquire.ftp.log	Log file of FTP process
	tdlet_HHz.acquire.status	Status file of acquisition process
	tdlet_HHz.subset.log	Log file of subset process
	tdlet_HHz.subset.status.ec	Status file of East Coast subset process
.../scripts	tdlet.sh	Primary interactive UNIX script to retrieve ETSS model output
	tdlet_HHz.ftp	UNIX FTP parameters script called by tdlet.sh
	tdlet_HHz.sh	UNIX date/time script that sends parameters to tdlet.sh
.../sorc	reformat_tdlet_ec.f	FORTRAN program to subset ETSS model East Coast file

5.2. NCEP Model Output File

The ETSS model output files are located on the IBM SP in the directory: **/com/avn/prod/avn.YYYYMMDD** (Table 5.2). The file for the East Coast region is called **tdlsurge.00e** and contains forecasts for 60 sites along the Atlantic coast and into many estuaries (Table 5.3). The WMO header for this file is EQUS23KWB. These text files contain the analysis (0-h) and hourly water level forecasts out to 48 hours. The water level analysis and forecasts have units of only tenths of feet and are valid at times expressed in UTC.

Table 5.2. Name and location of ETSS model output (00 and 12UTC) on the NCEP IBM SP computer, where YYYY is year, MM is month, and DD is calendar day. ([1] based on NCEP's estimation as of January 16, 2001. Changes can be found at http://www.ncep.noaa.gov.
* estimated based on NCEP's delivery time for Aviation Model's 84-h forecast projection.)

NCEP Computer	NCEP DIRECTORY PATH AND FILE NAME	NCEP DELIVERY TIME (UTC)[1]
IBM SP	/com/avn/prod/avn.YYYYMMDD/tdlsurge.00e	0400*
	/com/avn/prod/avn.YYYYMMDD/tdlsurge.12e	1602*

5.3. Acquisition and Subsetting Programs

The central ODAAS shell script responsible for acquiring, subsetting, and archiving ETSS model output is **tdlet.sh**. This UNIX script is interactive and requires command-line, input parameters for year, month, calender day, day in year, and cycle time (00 or 12). Two UNIX scripts, **tdlet_00z.sh** and **tdlet_12z.sh**, call **tdlet.sh** and contain the parameters necessary for daily runs of the 0000 UTC and 1200 UTC cycles, respectively. These parameter scripts are automatically started via a UNIX '`crontab`' command at specific times of the day. All of these scripts are located in the directory: **/ODAAS/ocean/fcsts/tdlet/scripts**.

The subsetting FORTRAN executable for the East Coast is called **reformat_tdlet_ec.x** and is located in the directory: **/ODAAS/ocean/fcsts/tdlet/exec**. The source code, **reformat_tdlet_ec.f**, can be found in the directory: **/ODAAS/fcsts/tdlet/sorc**.

Table 5.3. List of ETSS model forecast site locations for U.S. East Coast. ([1]ODAAS station identification (4 characters in length). *Only the files for CBBT are saved for several months.)

Forecast Site	Station ID[1]	Forecast Site	Station ID[1]
Eastport, ME	east	Baltimore, MD	balt
Bar Harbor, ME	barh	Annapolis, MD	anna
Portland, ME	port	Cambridge, MD	camb
Portsmouth, NH	ptnh	Washington, DC	wash
Boston Harbor, MA	bost	Solomons Island, MD	solo
Woods Hole, MA	wood	Wachapreague, VA	wach
Buzzard's Bay, MA	buzz	Glouster Point, VA	glou
New Bedford, MA	bdfd	Kiptopeke, VA	kipt
Sandwich, MA	sndw	Colonial Beach, VA	coln
Nantucket Island, MA	nant	Lewisetta, VA	lwst
Newport, RI	newp	Portsmouth, VA	ptva
Providence, RI	prvd	Virginia Beach, VA	vabh
Block Island, RI	blok	Old Point Comfort, VA	comf
Montauk, NY	mont	Hampton Roads, VA	hamp
New London, CT	lond	Chesapeake Bay Bridge Tunnel, VA	cbbt*
Bridgeport, CT	brdg	Cape Hatteras, NC	hatt
Stamford, CT	stam	Duck, NC	duck
Port Jefferson, NY	jeff	Wilmington, NC	wilm
Battery, NY	batt	Wrightsville Beach, NC	wrts
Bergen Point, NY	berg	Avon, NC	avon
Willets Point, NY	will	Beaufort, NC	beau
Long Beach, NY	long	Morehead City, NC	mrhd
Sandy Hook, NJ	sand	Holden Beach, NC	hold
Atlantic City, NJ	atlc	Charleston, SC	char
Cape May, NJ	cape	Myrtle Beach, SC	myrt
Philadelphia, PA	phil	Springmaid, SC	spri
Reedy Point, DE	reed	Savannah, GA	savn
Lewes, DE	lews	Savannah RI ENT, GA	svna
Breakwater Harbor, DE	brkw	Fort Pulaski, GA	ftpu
Ocean City, MD	octy	Fernandina, FL	fern

5.4. Forecast Sites and Filenames

The forecasts for CBBT are stored permanently in a dated file using the naming convention **YYYYMMDDHH.cbbt**, where YYYY is the four-digit year, MM is the month, DD is the calendar day, and HH is the forecast cycle in UTC (last two digits have been dropped to minimize filename length). The file is stored in the directory:
/ODAAS/ocean/tdlet/arhives/YYYYMM/cbbt.

The original ETSS model text output file for the East Coast stations is renamed as **YYYYMMDDHH.ec**, where ec indicates the East Coast region. The file is stored in the directory: **/ODAAS/ocean/fcsts/tdlet/archives/YYYYMM/ec**.

5.5. Content of Files

The individual station file for CBBT contains 48 hourly forecast records. Each record contains seven fields: forecast projection hour and minute, valid time (UTC), and subtidal water level forecast in meters. There is also header information including cycle time and date. The structure of the ODAAS-generated forecast file for CBBT is given in Figure 5.1.

TDLETSSM Forecast for Site: cbbt		
Cycle (Time (UTC)/Date): CHOUR CYEAR CMM CDY CJDY		
FP YYYY MM DD HH (UTC)	JD SUBTIDAL ELEV (m)	
XX XXXX XX XX XX XXX	X.XXXX	(0-h forecast projection)
XX XXXX XX XX XX XXX	X.XXXX	(1-h forecast projection)
XX XXXX XX XX XX XXX	X.XXXX	(2-h forecast projection)
⋮		
XX XXXX XX XX XX XXX	X.XXXX	(48-h forecast projection)

Figure 5.2. The structure of the ODAAS subsetted text file of ETSS model forecasts for CBBT, where CHOUR is the cycle hour, CYEAR is the cycle year, CMM is the cycle month, CDY is the calender day of the cycle, CJDY is the day in year of the cycle, FP is the forecast projection, YYYY is the forecast projection year, MM is the forecast projection month, DD is the calender day of the forecast projection, and HH is the cycle hour of the forecast projection. The time and date information and forecasts for a given forecast hour are indicated by XXs.

5.6. Status Files

Status files indicating whether the acquisition, subsetting, and archiving of the ETSS model hourly subtidal water level forecasts was successful can be found in the directory: **/ODAAS/ocean/fcsts/tdlet/execlog**. There are two sets of status files. Status file **tdlet_HHz.acquire.status**, where HH is the cycle hour, contains information about the FTP process. The other status file **tdlet_HHz.subset.status.ec** contains information about the subsetting of the original ETSS model message into individual station files for the East Coast. Each file contains one line consisting of six fields: a flag indicating success (1) or failure (0), the year, month, calendar day, day in year, and cycle time (0000 or 1200).

5.7. Log Files

There are three log files for use by persons responsible for monitoring ODAAS' acquisition of ETSS model output. The file **tdlet_HHz.acquire.ftp.log** is a log file containing FTP transaction information when the original ETSS model bulletin is transferred from NCEP to NOS. The log file **tdlet_HHz.subset.log** records the subsetting process. The file **get_HHz.log** is a log of the screen output generated as **tdlet_HHz.sh** is launched from the UNIX '`crontab`' command. All of these files are located under the directory: **/ODAAS/ocean/fcsts/tdlet/execlog**.

5.8. Display of Output

Time series plots of hourly subtidal water levels from the 0000 and 1200 UTC cycles for CBBT can be created using the ETSS model templates **gif_00z.tplate** and **gif_12z.tplate** and the UNIX shell scripts **plotgif_00z.csh** and **plotgif_12z.csh**. These programs are available from CSDL.

5.9. Schedule

ODAAS scripts are scheduled via a UNIX '`crontab`' command to acquire ETSS model output hourly water level forecasts at the times given in Table 5.4. The ETSS model script is designed to pause for 900 seconds (15 minutes) using the UNIX '`sleep`' command before attempting another FTP session to acquire the output files. The '`sleep`' command will repeat until the designated '`sleep`' cutoff time given in Table 5.4 is reached.

Table 5.4. Directory location, script names, and timing characteristics for ETSS model scripts (alias *tdlet*) on the CO-OPS SGI workstation.

ODAAS DIRECTORY *ALIAS: tdlet*	**AUTO SCRIPT**	**TIMING CHARACTERISTICS**			**MANUAL SCRIPT**
		Launch Time (UTC)	***Sleep Period* (sec)**	***Sleep Cutoff (UTC)***	
/ODAAS/ocean/fcsts/tdlet/scripts	tdlet_00z.sh	0430	900	0900	tdlet.sh
/ODAAS/ocean/fcsts/tdlet/scripts	tdlet_12z.sh	1630	900	2300	tdlet.sh

5.10. Troubleshooting

Occasionally, the ODAAS scripts fail to acquire the ETSS files. Commonly, these failures may be due to a lack of model output at NCEP possibly because the model was run late or canceled, a communication problem occurred with NCEP, or an abrupt, unscheduled change happened in file naming conventions at NCEP. The following describes some troubleshooting procedures to help identify and react to problems with ETSS model acquisition.

ETSS model problems are normally recognized by the Automated ODAAS Status Report (see Monitoring Procedures, Section 6). The automated message scripts are launched twice a day for

the 0000 UTC and 1200 UTC cycles. As the scripts check for the presence of ETSS model output at CO-OPS, three message types for the ETSS model may be displayed in the ODAAS log file.

(1) ETSS model file appears to be of sufficient size

If this message appears then the East Coast domain ETSS model file was received properly at CO-OPS. This message can be confirmed by inspecting the file **YYYYMMDDHH.ec**, where YYYY is the year, MM is the month, DD is the day, and HH is the cycle time. This file is located under the directory: **/ODAAS/ocean/fcsts/tdlet/archives/YYYYMM/ec**, where YYYY is the year and MM is the month, and the file size should be 13,305 bytes.

(2) ETSS model file is too small. Check whether TDL model is late in execution or network problem

This message occurs if the number of bytes calculated for the East Coast domain file is less than 13,304. Possible causes could be that network connections were lost between NCEP and CO-OPS during the FTP process, there is a lack of disk space at CO-OPS to store the full file, or the model is still running at NCEP.

To check disk space at CO-OPS use the UNIX command '`df .`'. If the space listed is more than 95% occupied, then room should be made for the new ETSS output. As a general rule when removing ETSS files, at least 3 months of ETSS East Coast domain files and subsetted Chesapeake Bay Bridge Tunnel files should be kept online. If large amounts of space are necessary to successfully retrieve and store the ETSS model output, then it may be necessary to remove Eta-22 model files, since removing ETSS files only relieves a small amount of disk space (see Troubleshooting, Section 4.10, for details about Eta-22).

To investigate any failures in the FTP process it is a good idea to check the FTP log file, **tdlet_HHz.acquire.ftp.log**, located under the directory: **/ODAAS/ocean/fcsts/tdlet/execlog**.

In order to retrieve the ETSS model output files, one will need to re-run the UNIX script **tdlet_HHz.sh**, where HH is the needed cycle time. If more than a day has passed since the missing data was noticed, it is possible to run **tdlet.sh** followed by date arguments to retrieve the complete files. It is a good idea to create backups of the partial ETSS model files before beginning these tasks.

(3) *** FILE DOES NOT EXIST!! ***

This message occurs if the ETSS model file, **YYYYMMDDHH.ec**, where YYYY is the year, MM is the month, DD is the day, and HH is the cycle time, is not present in the ETSS model archives directory. Possible causes include blocked communications with NCEP, the UNIX '`crontab`' command did not launch the ETSS model retrieval script, or the model output is not available at NCEP.

In order to pinpoint the cause for the missing model output, there are several sources to contact. The first source is NCEP itself. By navigating to the ETSS model production directory on the computer at NCEP, one can determine whether the files exist for retrieval (see Table 5.2).

To investigate ODAAS script problems the log files should be checked. The log file **get_HHz.log**, where HH is the cycle time, contains all screen output and may contain useful UNIX error messages, such as flags for timed out processes or files not being created. The log file **tdlet_HHz.acquire.ftp.log**, where HH is the cycle time, shows whether FTP communications were established to NCEP or if the process paused properly via the UNIX '`sleep`' command.

The log file **tdlet_HHz.subset.log**, where HH is the cycle time, shows whether ODAAS' FORTRAN program functioned properly in order to subset the East Coast domain file.

In summary, when troubleshooting for ETSS model acquisition, it is best to

- Determine whether the file exists at NCEP and check SDM messages and/or the NCEP/NCO Web page for delay notices from NCEP (see Monitoring Procedures, Section 6, for Internet address)
- Determine whether the ODAAS script is still an active process on the CO-OPS workstation by using the UNIX command

  `'ps -u cbcaster'`

  If the output is available at NCEP and the script is still running, it is best to let it finish. Every 15 minutes, the UNIX script **tdlet.sh** will ping NCEP and attempt to retrieve the ETSS model files.

  If the output is not available and the script has paused indefinitely, you may need to stop the script by using the UNIX '`kill`' command with the process IDs (PID) for **tdlet_HHz.sh** and **tdlet.sh**

  `'kill PID'`

  The script should eventually stop when it reaches the designated UNIX '`sleep`' cutoff hour (see Table 5.4), so this step may not be necessary.
- Finally, if ETSS model output is available, but cannot be obtained and processed by running the script **tdlet.sh** manually, then ODAAS personnel at CSDL should be contacted.

6. MONITORING PROCEDURES

There are two tools available to CO-OPS personnel to monitor ODAAS performance. One tool is the "Automated ODAAS Status Report" which can be e-mailed twice a day, and the other is the "Daily Status Report of ODAAS on Portscast" which can be e-mailed once a day. These messages can be mailed to the CO-OPS personnel responsible for monitoring ODAAS. The script and log files associated with these tools are located under the directories: **/ODAAS/status/scripts/auto** and **/ODAAS/status/execlog**, respectively.

The status of ODAAS' ability to acquire, process, and archive model output for the 0000 UTC and 1200 UTC cycles can be provided in the "Automated ODAAS Status Report." The generation script for this report is called **automodel_HHz.sh**, where HH is the cycle time. The UNIX script is launched during the times listed in Table 6.1 and creates a log file called **automodel_HHz.log**, where HH is the cycle time. The log file is automatically mailed to the personnel addressed in the script. In order to modify the personnel list, one will need to edit the last lines of the script under the sub-heading "Mail Automated Status Message." Usage:

```
'Mail -s AUTO_00Z_ODAAS_Report firstname.lastname@noaa.gov < $AUTOLOG'
```

For more information regarding the checks and messages associated with the log files, see the troubleshooting sections for the Eta-22 (Section 4.10) and ETSS models(Section 5.10).

Table 6.1. Directory location, script names, and execution times of automated ODAAS status message scripts (alias *status*) on the CO-OPS SGI workstation.

ODAAS DIRECTORY *ALIAS: status*	**AUTO SCRIPT**	**TIMING CHARACTERISTICS**
		Launch Time (UTC)
/ODAAS/status/scripts/auto	automodel_00z.sh	1100
/ODAAS/status/scripts/auto	automodel_12z.sh	1900
/ODAAS/status/scripts/auto	dailyreport.sh	1645
/ODAAS/status/scripts/auto	weekendreport.sh	1230 each Monday

The summarized status of ODAAS' ability to acquire, process, and archive model output during the past 24 hours can be provided in the "Daily Status Report of ODAAS on Portscast" which is e-mailed to interested CO-OPS and CSDL personnel. Additionally, the 'ODAAS Weekend Status Report' which contains status information for the past 72 hours can be automatically e-mailed every Monday to interested personnel. The primary purpose of these reports is to inform NOS forecast system developers of any problems encountered in acquiring model output from NCEP which might affect the execution of CBOFS.

The scripts required to create the daily status report and weekend status report are called

dailyreport.sh and **weekendreport.sh**, respectively. These scripts are located under the directory: **/ODAAS/status/scripts/auto** and can be launched automatically via the UNIX '`crontab`' command.

An example of the daily report is given in Figure 6.1. The report is normally issued between 1600 and 1700 UTC (11 A.M. to 12 P.M. EDT) and contains information about any problems and scheduled maintenance at NCEP or CO-OPS that have or may affect the ability of ODAAS to acquire model output from NCEP. The NCEP information is obtained from the examination of NCEP's product information Website at http://www.ncep.noaa.gov/NCO/PMB/nwprod/prodstat and in the 'SPECIAL NCEP DISCUSSION' issued throughout the day by the NCEP Senior Duty Meteorologist (SDM). These NCEP discussions are available via NOAAPORT and the Internet.

Specific instructions for creating the daily status message are given in Appendix A. It is anticipated that NOS/CO-OPS will issue a message twice a day similar to NCEP's 'Special Discussion' to inform NOS users about CBOFS progress or problems. This CBOFS message will be disseminated via the Web and possibly NOAAPORT and will include a discussion of related problems such as late Eta or ETSS model execution or problems with the NOAA campus computer network.

DAILY STATUS REPORT OF ODAAS ON PORTSCAST
NOAA/NATIONAL OCEAN SERVICE
CENTER FOR OPERATIONAL OCEANOGRAPHIC PRODUCTS AND SERVICES
SILVER SPRING, MARYLAND
Wed Jan 17 2001

MEREDITH WESTINGTON
NOS/Coast Survey Development Lab

SYSTEM	DATE (UTC)	CYCLE (UTC)	SCHEDULED COMPLETION @NCEP (UTC)	FIRST REQUESTED (UTC)	MODEL OUTPUT PROCESSED (UTC)
ETA22	16	12	14:27	14:50	16:25
	17	00	02:16	02:40	03:49
	17	12	14:27	14:50	16:23
TDLET	16	12	16:03	16:15	16:30
	17	00	04:01	04:15	04:30
	17	12	16:03	16:15	16:30

ETA22 = NCEP Eta Mesoscale Atmospheric Prediction Model (22 km resol)
TDLET = NWS Extra-Tropical Storm Surge Prediction Model

END

Figure 6.1. Example of ODAAS Daily Status Message.

7. PERMANENT ARCHIVING PROCEDURES

Since the Eta-22 model output GRIB files are large (approximately 90Mb), only the last 3 days of output are kept on-line at the CO-OPS workstation. The ETSS model output files and Eta-22 model subsetted bin files are small; therefore, they are kept on-line for 6 months. To maintain enough space at the CO-OPS workstation a purge script was created. The purge script, **purger.sh**, is located at **/ODAAS/status/scripts** and is run daily via the UNIX '`crontab`' command. This script maintains both Eta and ETSS model output files.

It is anticipated that CO-OPS personnel will archive the subsetted Eta model output (binary format) and ETSS model output (text format) on a monthly basis.

8. SOFTWARE MAINTENANCE

ODAAS scripts and programs require regular updating whenever NCEP makes changes in the resolution of the Eta model, the file and/or directory naming convention, the expected time for posting the output on the NCEP computers, or in their computer platforms and associated IP addresses. NCEP anticipates implementing a new higher resolution version of Eta in November, 2001. ODAAS scripts and programs will have to be modified to take account such changes. An explanation of the changes that are required to subset the model output from a different resolution version of the Eta model is given in Appendix B. The ODAAS scripts will also have to be changed when output is acquired from NCEP data servers instead of the NCEP IBM SP using DBNet software (http://www.ncep.noaa.gov/USSG/dbnet/doc_2.95).

9. PLANNED ENHANCEMENTS

The improvements, changes, or additions that may be added to ODAAS in the future are as follows:

a) Modification of Eta scripts and programs when a higher resolution of Eta is implemented at NCEP (planned for November 2001).

b) Acquisition of NOS NWLON and PORTS meteorological and oceanographic observations.

c) Acquisition of USGS real-time river gauge discharge observations and NWS RFC river discharge forecast guidance.

d) Creation of status flags for CO-OPS' Continuous Operational Real-Time Monitoring System (CORMS) personnel.

10. ACKNOWLEDGMENTS

ODAAS was originally created in CSDL by Charles Sun in 1996. The responsibility of maintaining ODAAS and its development was transferred to Eugene Wei in 1997. In January 1998, the responsibility was given to John Kelley. The monitoring, maintenance, and development of ODAAS was carried out by John Kelley, Sarah Maxwell, Eugene Wei, and Environmental Careers Organization (ECO) intern Allison Thomson between 1998 and March 2000. Presently, CSDL's Meredith Westington, John Kelley and Eugene Wei are responsible for ODAAS at CSDL and CO-OPS. Thanks to CO-OPS' Kate Bosley and Tom Bethem, and CSDL's Frank Aikman and Kurt Hess for reviewing this technical report.

REFERENCES

Black, T. L., 1994: The new NMC mesoscale Eta Model: Description and forecast examples. **Weather and Forecasting**, 9. pp. 265-278.

Chen, J., W. Shaffer, and S. Kim, 1993: A forecast system model for extratropical storm surge. **Advances in HydroScience and Engineering**, 1. pp. 1437-1444.

Evans, M., G. French, and T. Bethem, 1998: Information Systems Branch PORTS Uniform Flat File Format (PUFFF). NOAA/National Ocean Service, Office of Coast Survey, Oceanographic Products and Services Division, Information Systems Branch, Silver Spring, MD. pp. 28.

Gross, T. F., K. T. Bosley, and K. W. Hess, 2000: The Chesapeake Bay Operational Forecast System (CBOFS): Technical Documentation. **NOS Tech Report** OCS/CO-OPS 1. NOAA/NOS, Silver Spring, MD. pp. 68 (In press).

Peters, C., 1998: NCEP Standards for Operational Codes and Implementations. NCEP Technical Note, **OMB Contribution**, No. 158. NOAA/NWS, Camp Springs, MD. pp. 22.

Rogers, E., M. Baldwin, T. Black, K. Brill, F. Chen, G. DiMego, J. Gerrity, G. Manikin, F. Mesinger, K. Mitchell, D. Parrish, and Q. Zhao, 1997: Changes to the NCEP Operational "Early" Eta Analysis/Forecast System. **NWS Technical Procedures Bulletin** No. 447. NOAA/NWS, Silver Spring, MD. pp. 11.

Staudenmaier, M., Jr., 1996: A Description of the Meso Eta Model. NWSO Sacramento, CA, **NWS Western Region Technical Attachment** No. 96-06. Salt Lake City, UT. pp. 5.

Thomson, A. M., 2000: Acquisition Status of Real-Time River Observations and River Forecast Guidance for Use in NOS Estuarine Nowcast/Forecast System Development, **NOS Technical Report** NOS CS 8. Coast Survey Development Laboratory, Silver Spring, MD. pp. 27.

APPENDIX A: INSTRUCTION FOR CREATING THE MORNING ODAAS STATUS MESSAGE

1) Log on to portscast.nos.noaa.gov. Open a UNIX shell. Change directories to **/ODAAS/status/execlog**. This redirection can be achieved by typing the alias '`status`' when you are logged on and typing '`cd execlog`'.

2) Edit the automated status message, **dailyreport.log** or **weekendreport.log**, to report any maintenance and/or problems with ODAAS and/or with NCEP's operational computers or data servers. Also, report any relevant information found in the ODAAS script log files or NCEP Special Discussion messages (SDM):
http://www.ncep.noaa.gov/NCO/PMB/nwprod/prodstat/ncep_sdm_message
or http://www.arl.noaa.gov/ready-bin/getdscn.pl?product=NCEP+Operations.

Note: Currently, the **dailyreport.log** and **weekendreport.log** files are automatically created and mailed without any maintenance/problem notices through the UNIX scripts **dailyreport.sh** and **weekendreport.sh**, respectively. A designated person from CO-OPS may be chosen to manually edit the status messages prior to dissemination to announce these notices. This feature can be turned off in the UNIX '`crontab`' command file, **cronodaas**, located under the **/ODAAS** directory.

3) If there is a missing file for any model, first check to see if the script is still paused by the UNIX '`sleep`' command by typing the command

'`ps -u cbcaster`'

If the script appears to have paused indefinitely, stop the script typing the UNIX command

'`kill -9 PID`'

where PID is the process ID of the script. Check the model's log files, then follow these troubleshooting steps:
Question: Is the missing file at NCEP'S IBM SP workstation?

A) If YES, run the manual UNIX script (either **eta22.sh** or **tdlet.sh**) by entering the required date and time information of the requested model cycle. For example, if the 1200 UTC ETSS model output was not received on January 5, 2001, then navigate to the ETSS model script's directory and type '**`tdlet.sh`** `2001 01 05 05 12`', where 2001 is the year, 01 is the month, 05 is the day, 05 is the day in year, and 12 is the cycle time. Report in the status message that the problem was an ODAAS script failure and the model output had to be retrieved manually. Additional information on troubleshooting for the Eta and ETSS models can be found in Sections 4.10 and 5.10, respectively.

B) If NO, report in the status message that there is a problem at NCEP. Keep monitoring the IBM SP to see if the file is created later. Also, check the Special Discussion Messages (SDM) to see if they report on the problem. Include as much information as possible to explain any problems with ODAAS' ability to acquire data.

4) To send the status message, choose the appropriate mail script. There are two scripts currently

available under **/ODAAS/status**. Launching the UNIX script **mailstat-day** will mail the **dailyreport.log** file to the names listed in the script. Executing **mailstat-end** will mail the **weekendreport.log** file to the names listed in the script. To mail the daily status message, type '**`mailstat-day`**' at the command prompt.

Occasionally, special notices need to be generated during the middle of the day to discuss upcoming planned maintenance at NCEP or major problems with ODAAS and/or NCEP. These messages can be created by editing the file **special.log** under **/ODAAS/status/execlog**. Once edited and saved the file can be e-mailed using the script **mailstat-special** under the directory: **/ODAAS/status**.

5) Currently, the daily and weekend status messages are automatically written to a status file archive under **/ODAAS/status/archives**. The archive file is named **YYYYMM.status.log**. The status messages are appended to each other in this log file each time the UNIX '`crontab`' command launches **dailyreport.sh** and **weekendreport.sh**.

Note: If the UNIX '`crontab`' command is not set to automatically activate **dailyreport.sh** and **weekendreport.sh**, the **mailstat-day** and **mailstat-end** scripts will need to be launched manually to mail the status files. Also, **dailyreport.sh** and **weekendreport.sh** will need to be edited to remove the mail statements and the concatenate statements that create the status archives file. These two functions are already inherent in the **mailstat-day** and **mailstat-end** scripts.

APPENDIX B: INSTRUCTIONS FOR MODIFYING ODAAS' ETA SUBSETTING PROGRAMS TO TAKE INTO ACCOUNT CHANGES IN MODEL RESOLUTION

NCEP increases the horizontal and vertical resolutions of their Eta mesoscale atmospheric prediction model on a frequency of approximately every 1 to 2 years. Since NOS uses Eta forecast output on its native grid, this requires modification of ODAAS programs, primarily those programs related to subsetting. A description of the steps required to modify ODAAS programs to process the higher resolution native gridded output is provided in this appendix.

Steps:

1) Stay abreast of planned changes to NCEP' Eta model

a) Get on the NCEP Mesoscale Modeling Branch (MMB) mailing list maintained by Geoff DiMego (gdimego@ncep.noaa.gov), chief of MMB.

b) Attend occasionally the MMB bi-weekly meetings at NCEP's Environmental Modeling Center in Camp Springs, Maryland. Notices of these meetings are sent via e-mail by Eric Rogers (wd20er@ncep.noaa.gov) of MMB.

2) Obtain sample GRIB files for a particular cycle from the new version of the Eta model.

- When a new version of Eta model is planned, MMB personnel run a parallel version of the new version on the IBM SP. These output files will be in GRIB format. The native grid GRIB files usually have 'egrdsf' in their file name. The location and exact names of these files can be obtained from Eric Rogers of MMB.

3) Create a new directory structure for the new version of the Eta model (i.e. **/ODAAS/atmos/fcsts/eta22**) with the proper sub-directories on the computer where ODAAS programs and scripts are executed.

4) Obtain and degrib the sample GRIB output files from the new (experimental) version of the Eta model for the entire Eta grid domain.

a) Make a copy of the shell script **etaXX.sh** from the script directory for the previous version of the Eta model and move to the script directory for the new version.

b) Modify the script to acquire the sample GRIB files from the either the IBM SP computer or NCEP's anonymous FTP server.

1) change IP address of the NCEP computer, if necessary,

2) check if the NCEP directory name, **NCEPPRODDIR**, points to the directory containing the GRIB files from the experimental version,

3) check if the NCEP GRIB filenames for the new version (i.e. in "DOWNLOAD ETA GRIB FILES" section) are correct,

4) set the type of run flag, "runflag" to 'exp' (i.e. experimental) so script will use input directory and filenames for the new version,

5) set subset flag, "subflag" to 'NO' to prevent subsetting output for NOS estuarine forecast systems, and

6) set variable defining the new version, "ver" to the proper value (e.g. 32 for Eta-32, 22 for Eta-22, etc...)

c) Run the script, **etaXX.sh**. Usage:

```
'etaXX.sh YYYY MM DD JD HH'
```

where XX is the version number.

The resultant binary output file is called **curdayCCetaXX.bin** and is located in the directory: **/ODAAS/atmos/fcsts/etaXX/archives/recent/domain**.

5) Obtain the latitude and longitude coordinates for the "filled" grid points of the new version of the Eta model.

a) Modify the Eta model grid parameters in the include file, **etamodelparms.h**, located in the **sorc** directory.

These parameters include the following:
IM = no. of grid points of the Eta model native staggered grid in the x-direction,
JM= no. of grid points of the Eta model native staggered grid in the y-direction,
LM= no. of vertical levels,
PHI0 = center latitude (deg N)
LAM0 = center longitude (deg W)
DPHD = delta x (grid increment in the x-direction)
DLMD = delta y (grid increment in the y-direction)

The values for these parameters can be found in the NCEP GRIB Manual or obtained from Eric Rogers or Tom Black (wd21tb@ncep.noaa.gov) of MMB.

b) Recompile under FORTRAN 77, the program, **obtain-eta-latlon.f** using the makefile, **makeobtain**. (Presently, the program will not execute properly when compiled with the FORTRAN 90 compiler.)

c) Run the shell script, **run-obtain-eta-latlon.sh** to execute the FORTRAN program and store the resultant output files in the proper directories and subdirectories. Usage:

```
'run-obtain-eta-latlon.sh XX CC'
```

where XX is the version number and CC is the cycle hour.

The input file is **curdayCCetaXX.bin**, a binary file containing the degribbed output on the native staggered grid of the new version where CC represents the cycle hour (i.e. 00, 06,

12, or 18) and XX is the version number (i.e. horizontal resolution). This file was created by the shell script, **etaXX.sh** in the previous step.

The resultant output files, **etaXX-lat-domain.2d** and **etaXX-lon-domain.2d** contains the latitude and longitude coordinates, respectively. The files are stored in the directory **/ODAAS/atmos/fcsts/etaXX/info**, where XX is the version number. In addition, the program creates a text file containing the u and v components of the surface (10m AGL) wind velocity and mean sea level pressure. This file is called **curdayCCetaXX.txt**.

6) Create a map depicting the surface (10m AGL) wind velocity for the Middle-Atlantic states for one forecast hour using the Eta output in **curdayCCetaXX.txt** and the coordinate files, where CC is the forecast cycle hour and XX is the version number.

a) Copy the IDL template file, **plot-eta-winds-MIDATL-ps.tplate**, located in the directory: **/ODAAS/atmos/etaXX/fcsts/idl/tplates**, where XX is the present version of the Eta model, to the similar subdirectory for the new version.

b) Modify the values of coordinates of the filled Eta grid, IMT (IM*2-1) and JM in the IDL template, **plot-eta-winds-MIDATL-ps.tplate**. (Presently, both Eta-22 and Eta-32 degribbed files can be read and the wind vectors plotted.)

c) Copy the shell script, **plot-eta-winds-MIDATL-ps.csh**, located in the directory: **/ODAAS/atmos/etaXX/idl/scripts**, where XX is the present version, to the similar subdirectory for the new version.

d) Run the shell script, **plot-eta-winds-MIDATL-ps.csh**, to create and execute IDL program, **plot-eta-winds-EUSA-ps.idl**. Usage:

```
'plot-eta-winds-MIDATL-ps.csh XX CC'
```

where XX is the resolution of the new version and CC is the cycle hour.

The resulting postscript file of the surface wind map is called **plot-eta-winds-MIDATL.ps** and located in the directory: **/ODAAS/atmos/fcsts/etaXX/idl/ps**. An example of the wind file for Eta-22 is given in Figure B.1.

e) Examine the wind field for irregularities and compare to surface wind field on NOAA's ARL READY Web site (http://www.arl.noaa.gov/ready.html). Although, the fields from the present and new version of Eta will be different, there should be general agreement in terms of synoptic wind pattern.

f) If the fields are not similar then check input and output files. If necessary, contact CSDL personnel for further assistance.

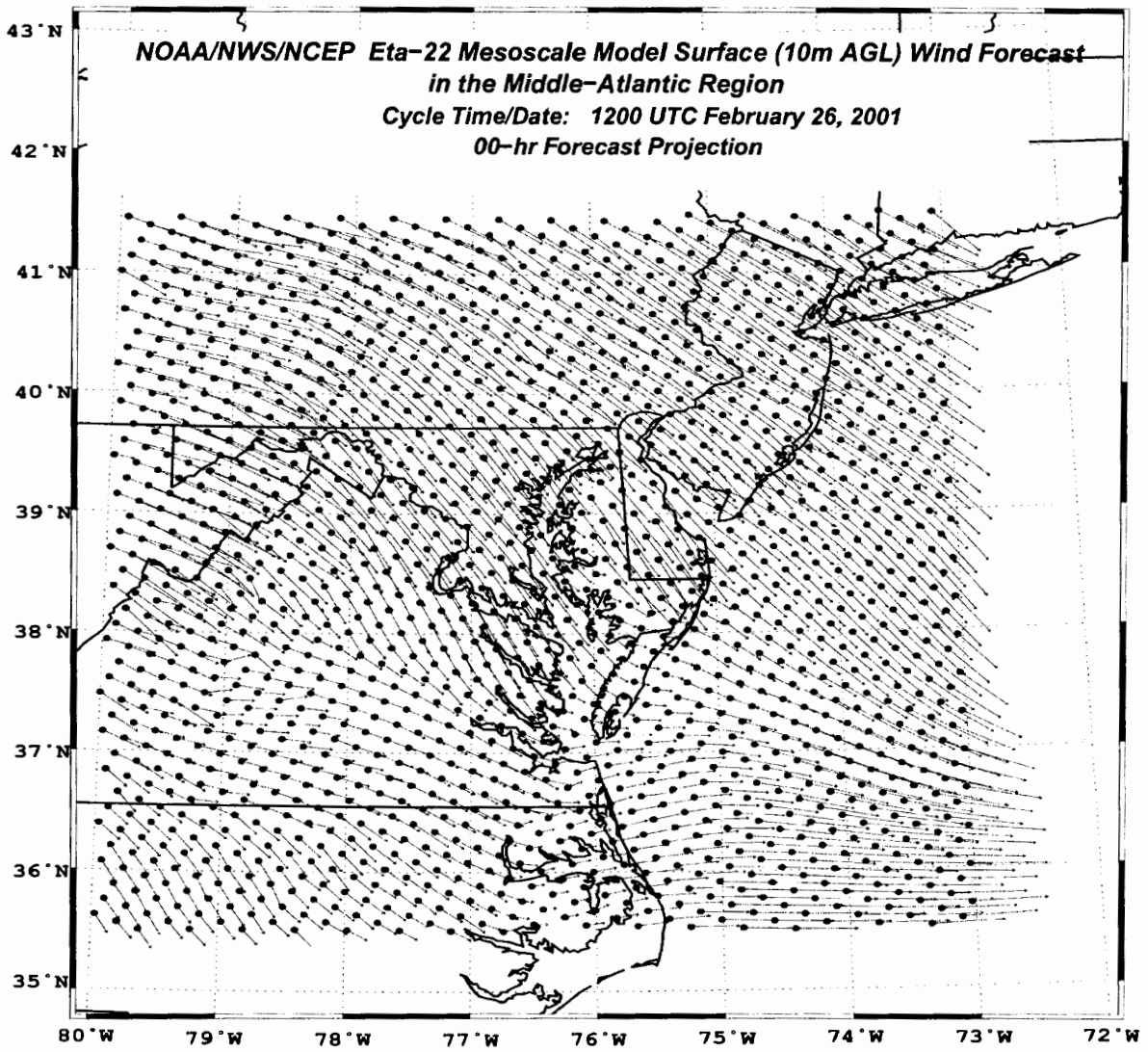

Figure B.1. Sample vector plot of Eta-22 model surface wind velocity analysis for the Middle Atlantic Region. Dots indicate locations of Eta model "filled" E grid points.

7) Create a map depicting the I and J coordinates of the filled Eta grid points in the Mid-Altantic States where I and J are referred to the origin, (1,1) in the SW corner of the Eta grid domain.

a) Copy the IDL template, **plot-eta-coords-MIDATL-ps.tplate** located in the directory: **/ODAAS/atmos/etaXX/fcsts/idl/tplate**, where XX is the present version of the Eta model, to a similar subdirectory for the new version.

b) Modify the values of the I and J dimensions (IMT and JM) in the IDL template, **plot-eta-coords-MIDATL-ps.tplate**. (Presently, both Eta-22 and Eta-32 degribbed files can be read and the grid points plotted.)

c) Copy the shell script, **plot-eta-coords-MIDATL-ps.csh**, located in the directory: **/ODAAS/atmos/etaXX/idl/scripts**, where XX is the present version, to a similar subdirectory for the new version.

d) Run the shell script, **plot-eta-coords-MIDATL-ps.csh**, to create and execute the IDL program, **plot-eta-coords-MIDATL-ps.idl**. Usage:

```
'plot-eta-coords-MIDATL-ps.csh XX CC'
```

where XX is the resolution of the new version and CC is the cycle hour.

The resulting postscript file of a map depicting the filled Eta grid points and their I and J coordinates is called **plot-eta-coords-MIDATL.ps**. It is located in the directory: **/ODAAS/atmos/fcsts/etaXX/idl/ps**. An example of the map is given in Figure B.2.

e) Examine the map for any irregularities. If problems exist, check the input files and then contact CSDL personnel if problems can not be solved.

f) Select an area over the Mid-Atlantic states which covers approximately the same area as the previous version (i.e. Chesapeake Bay and Delaware Bay regions) and identify the starting and ending I and J coordinates.

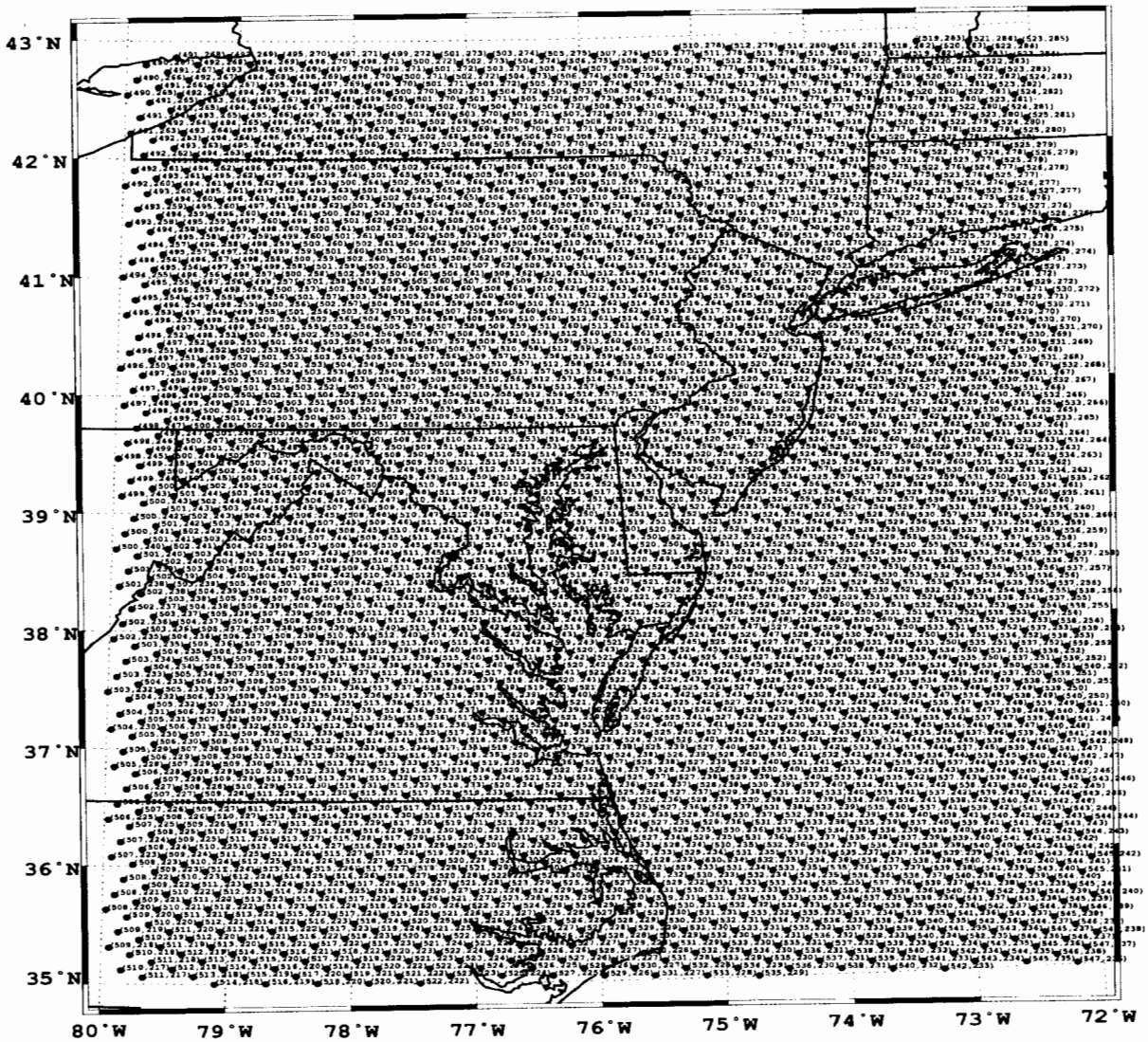

Figure B.2. Locations and I and J grid coordinates for Eta-22 model "filled" native E grid in the Middle Atlantic Region.

8) Create new executable of the FORTRAN program used for subsetting Eta output for the Chesapeake Bay region, **subset-cbay-etaXX.f**, where XX is the resolution of the new version.

a) Copy the FORTRAN program, **subset-cbay-etaXX.f**, located in the directory: **/ODAAS/atmos/etaXX/sorc** and rename it to indicate the new version (i.e. **subset-cbay-etaYY.f**), where XX is the resolution of the present version of the model and YY is the resolution of the new version.

b) Change the starting and ending I and J coordinates in subroutine SUBSET to the values identified in step 7f above. The variables indicating the starting and ending coordinates are IS, IE, JS, and JE.

c) Recompile the program using the makefile, **makesubsetcbay**

d) Test the new executable. Usage:

```
'subset-cbay-etaXX.ex curdayCCetaXX.txt curdayCCetaXX.bin
                      curdayCCetaXX.cb.txt'
```

where CC is cycle hour and XX is the resolution of the new version.

9) Create a map depicting the surface (10m AGL) wind velocity for subsetted area (i.e. the Chesapeake and Delaware Bay region) for one forecast hour using the Eta output in **curdayCCetaXX.cb.txt** and the coordinate files where CC is the forecast cycle hour and XX is the version number.

a) Copy the IDL template file, **plot-eta-winds-cb-ps.tplate**, located in the directory: **/ODAAS/atmos/etaXX/fcsts/idl/tplates**, where XX is the present version of the Eta model, to the similar subdirectory for the new version.

b) Modify the values of coordinates of the subsetted filled Eta grid in **plot-eta-winds-cb-ps.tplate**. (Presently, both Eta-22 and Eta-32 subsetted files can be read and the wind vectors plotted.)

c) Copy the shell script, **plot-eta-winds-cb-ps.csh**, located in the directory: **/ODAAS/atmos/etaXX/idl/scripts**, where XX is the present version, to the similar subdirectory for the new version.

d) Run the shell script, **plot-eta-winds-cb-ps.csh**, to create and execute IDL graphics program, **plot-eta-winds-EUSA-ps.idl**. Usage:

```
'plot-eta-winds-cb-ps.csh XX CC'
```

where XX is the resolution of the new version and CC is the cycle hour.

The resulting postscript file of the surface wind map is called **etaXX-winds-cb-HH-hr.ps**, where HH is the forecast hour, and is located in the directory: **/ODAAS/atmos/fcsts/etaXX/idl/ps**. An example of the wind file for Eta-22 is given in Figure B.3.

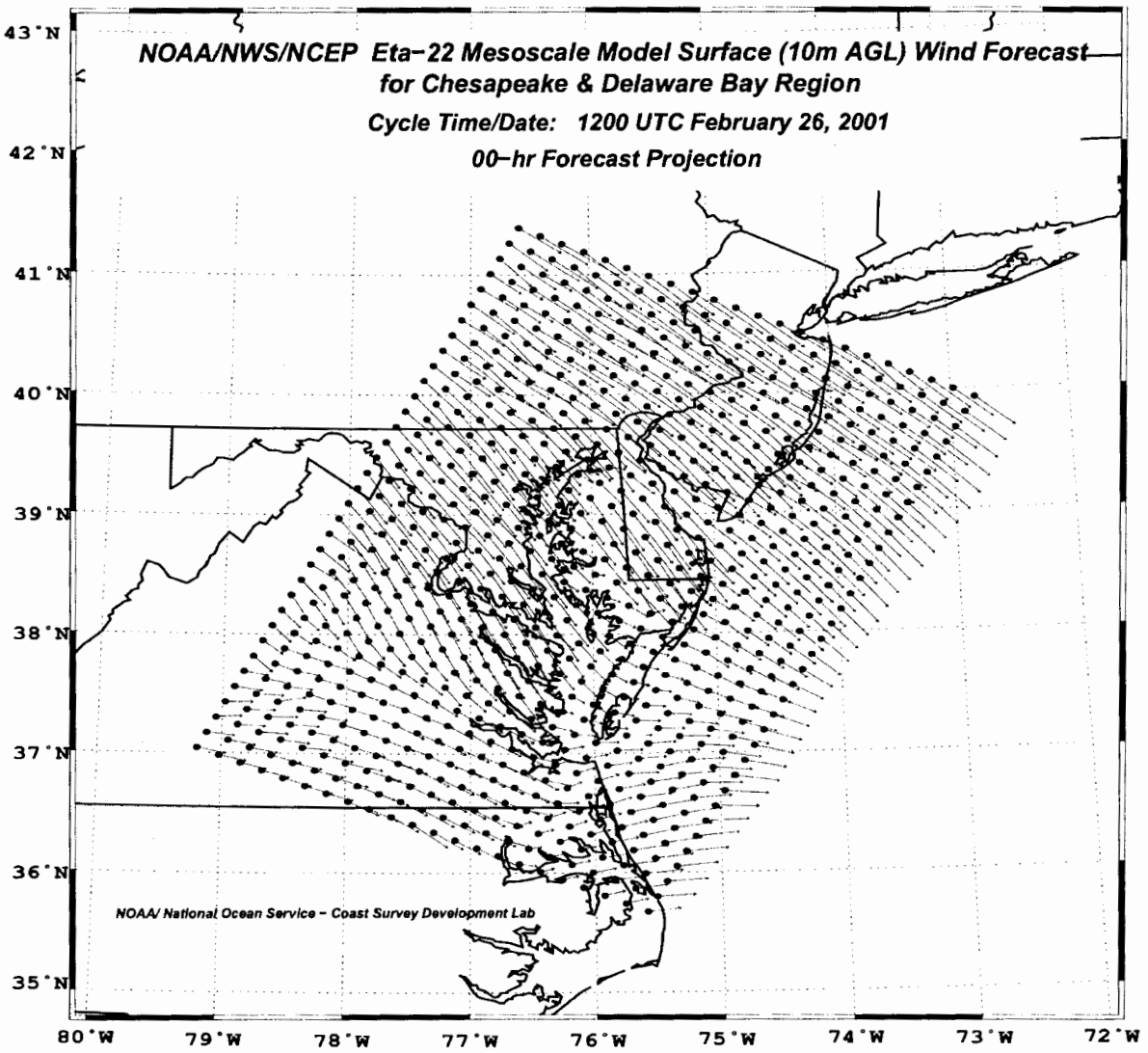

Figure B.3. Sample vector plot of Eta-22 model surface wind velocity analysis for the Chesapeake Bay region.

e) Examine the wind field for irregularities and compare to surface wind field on NOAA's ARL READY Web site (http://www.arl.noaa.gov/ready.html). Although, the fields from the present and new version of Eta will be different, there should be general agreement in terms of synoptic wind pattern.

f) If problems exist check input and output files. If problems persist, contact CSDL.

10) Modify **etaXX.sh** to allow the subsetting program, **subset-etaXX-cbay.f** to be executed.

a) Change the subsetting flag, subflag to 'YES'.

b) Test the shell scripts.

11) Modify **etaXX_HHz.sh**, where XX is the new version number of Eta and HH is the cycle time, so it executes **etaXX.sh**.

12) Enter **etaXX_HHz.sh** for each required forecast cycle in the ODAAS '`crontab`' command file, **cronodaas**, and monitor whether the output from the new version of Eta is acquired from NCEP and processed automatically at NOS.