

NOUS41 KWBC 011600
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Service Change Notice 24-77
National Ocean Service Headquarters Silver Spring MD
Relayed by National Weather Service Headquarters Silver Spring MD
1200 PM EDT Thu Aug 1 2024

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From: Patrick Burke
 Chief, Oceanographic Division
 NOS/Center for Operational Oceanographic Products and Services

Subject: NOS Operational Forecast System (OFS) Framework Version Updates
and Implementation of Oceanographic Forecast Modeling Systems for the
Salish Sea and Columbia River: Effective on or about September 9, 2024

Effective on or about Monday, September 9, 2024 beginning at 1500
Coordinated Universal Time (UTC), NOAA/National Ocean Service's (NOS')
Coastal Ocean Modeling Framework (COMF) will be updated to version 3.6.
With this update, the new Salish Sea and Columbia River Operational
Forecast System (SSCOFS) will be implemented by NWS/National Centers for
Environmental Prediction (NCEP) Central Operations (NCO).

The following are planned updates:

1. Changes to the existing OFS

With this COMF version update and in accordance with NCO's implementation
standards, all NOS OFS' model output file names will comply with the
following new file naming convention. The file contents for ROMS-based
OFS remain unchanged, the contents for FVCOM-based OFS have minor changes
(see section 2 and 3 in details):

Nowcast and forecast station output files will change from:

nos.{OFS}.stations.[nowcast|forecast].{YYYYMMDD}.t{CC}z.nc
to
{OFS}.t{CC}z.{YYYYMMDD}.stations.[nowcast|forecast].nc

The three-dimensional (3D) fields' nowcast(n) and forecast(f) output
files will change from:

nos.{OFS}.fields.[n|f]{HHH}.{YYYYMMDD}.t{CC}z.nc
to
{OFS}.t{CC}z.{YYYYMMDD}.fields.[n|f]{HHH}.nc

The optional two-dimensional (2D) nowcast(n) and forecast(f) output files will change from:

```
nos.{OFS}.2ds.[n|f]{HHH}.{YYYYMMDD}.t{CC}z.nc  
to  
{OFS}.t{CC}z.{YYYYMMDD}.2ds.[n|f]{HHH}.nc
```

Model input files will change from:

```
nos.{OFS}.init.nowcast.{YYYYMMDD}.t{CC}z.nc  
to  
{OFS}.t{CC}z.{YYYYMMDD}.init.nowcast.nc
```

Surface meteorological forcing files will change from:

```
nos.{OFS}.met.[forecast|nowcast].{YYYYMMDD}.t{CC}z.nc  
to  
{OFS}.t{CC}z.{YYYYMMDD}.met.[forecast|nowcast].nc
```

```
nos.{OFS}.hflux.[forecast|nowcast].{YYYYMMDD}.t{CC}z.nc  
to  
{OFS}.t{CC}z.{YYYYMMDD}.hflux.[forecast|nowcast].nc
```

The input forcing condition files will change from:

```
nos.{OFS}.[obc|clim|river].{YYYYMMDD}.t{CC}z.nc  
to  
{OFS}.t{CC}z.{YYYYMMDD}.[obc|clim|river].nc
```

```
nos.{OFS}.river.{YYYYMMDD}.t{CC}z.nc.tar  
to  
{OFS}.t{CC}z.{YYYYMMDD}.river.nc.tar
```

Runtime input files will change from:

```
nos.{OFS}.[forecast|nowcast].{YYYYMMDD}.t{CC}z.in  
to  
{OFS}.t{CC}z.{YYYYMMDD}.[forecast|nowcast].in
```

Log files will change from:

```
nos.{OFS}.[corms|forecast|jlogfile|nowcast].{YYYYMMDD}.t{CC}z.log  
to  
{OFS}.t{CC}z.{YYYYMMDD}.[corms|forecast|jlogfile|nowcast].log
```

The following will change for the cbofs, ciofs, dbofs, gomofs, tbofs, and wcofs OFS:

```
nos.{OFS}.roms.tides.{YYYYMMDD}.t{CC}z.nc  
to  
{OFS}.t{CC}z.{YYYYMMDD}.roms.tides.nc
```

And for the wcofs OFS only:

```
nos.{OFS}.avg.[forecast|nowcast].{YYYYMMDD}.t{CC}z.nc  
to  
{OFS}.t{CC}z.{YYYYMMDD}.avg.[forecast|nowcast].nc
```

Where OFS is OFS name acronym (e.g., cbofs, dbofs, tbofs, gomofs, ngofs2, leofs, lmhofs, loofs, lsofs, sfbofs, wcofs, ciofs);
CC is run cycle (e.g., 03, 09, 15, 21, and 00, 06, 12, 18);
YYYYMMDD is timestamp, YYYY (year), MM (month) and DD (day).
HHH is the HHH-th simulation hour (e.g., 001, 002).

2. Ice forecasting is reactivated for all Great Lakes OFS

The ice module was turned off in February 2023 because of unrealistic ice thickness forecasts in the Great Lakes OFS during the 2023 winter season. Corrections were added in the ice modules and tested using the 2023 hindcast simulations. These corrections fixes are included in the updated FVCOM package which is used in this implementation.

The following ice-related float variables are added to the field/gridded output files of the four Great Lakes' Operational Forecast Systems of Lake Erie (LEOFS), Lake Michigan and Huron (LMHOFS), Lake Ontario (LOOFS), and Lake Superior (LSOFS): aice, vice, latent_heat_flux, sensible_heat_flux, long_wave, tsfc, uice, and vvice.

The delivery time for all lake OFS will be delayed about 15 minutes due to reactivating ice forecasting.

3. Fields Output format changes of FVCOM-based OFS

To be more CF convention compliant, "time" variable is defined in double precision with units of seconds. Two time related variables of Itime and Itime2 are removed from the NetCDF output files. In the by-product of regular grid fields output NetCDF files, the variable name of "ocean_time" is replaced with "time".

The delivery time for all FVCOM-based OFS will be delayed between 5 to 15 minutes due to the updated FVCOM package taking longer time and reactivating ice forecasting for all Great Lakes OFS. Comparing with the current production products, sfbofs delays about 5 minutes, ngofs2 delays about 12 minutes, and all Great Lakes OFS (leofs, lmhofs, loofs, and lsofs) delay about 15 minutes.

4. Implementation of the Salish Sea and Columbia River Operational Forecast System (SSCOFS)

SSCOFS will provide users with nowcasts (analyses of near present) and forecast guidance of the physical conditions of surface water levels, 3-dimensional water currents, water temperature, and salinity out to 72 hours for the Puget Sound, the San Juan Islands, the Strait of Georgia, the Strait of Juan de Fuca, the Northern Pacific Coast and the lower Columbia River. This new FVCOM based model, with the Columbia River to the Bonneville Dam as part of its domain, will decommission the existing

Semi-implicit Eulerian-Lagrangian Finite Element (SELFE) based Columbia River and Estuary Operational Forecast System (CREOFS).

The following files from CREOFS will no longer be available once SSCOFS becomes operational:

```
nos.creofs.stations.nowcast.{YYYYMMDD}.t{CC}z.nc
nos.creofs.stations.forecast.{YYYYMMDD}.t{CC}z.nc
nos.creofs.fields.n{HHH}.{YYYYMMDD}.t{CC}z.nc
nos.creofs.fields.f{HHH}.{YYYYMMDD}.t{CC}z.nc
nos.creofs.obc.{YYYYMMDD}.t{CC}z.tar
nos.creofs.river.{YYYYMMDD}.t{CC}z.th.tar
nos.creofs.met.nowcast.{YYYYMMDD}.t{CC}z.tar
nos.creofs.met.forecast.{YYYYMMDD}.t{CC}z.tar
nos.creofs.init.nowcast.{YYYYMMDD}.t{CC}z.bin
nos.creofs.nowcast.{YYYYMMDD}.t{CC}z.in
nos.creofs.forecast.{YYYYMMDD}.t{CC}z.in
nos.creofs.corms.{YYYYMMDD}.t{CC}z.log
nos.creofs.jlogfile.{YYYYMMDD}.t{CC}z.log
nos.creofs.forecast.{YYYYMMDD}.t{CC}z.log
nos.creofs.nowcast.{YYYYMMDD}.t{CC}z.log
creofs.status
```

The SSCOFS unstructured triangular mesh has 239,734 nodes and 433,410 elements. The vertical grid follows the terrain and consists of 10 spatially-varying sigma-layers. The resolution varies from 100 m inside the estuaries to 500 m in deeper parts of Puget Sound and the Georgia Basin, and increases to 10 km over the continental shelf. Resolution inside the Columbia River varies between 100 m and 200 m.

The SSCOFS operates within the NOS Coastal Ocean Modeling Framework (COMF3.6) and has four daily nowcast and forecast cycles at 03, 09, 15, and 21 UTC.

The meteorological forcing used to run SSCOFS is based on the NWS North American Mesoscale (NAM) weather prediction model winds (for both nowcast and forecast). The NCEP's operational meteorological forecast products of Global Forecast System (GFS) are used as a backup for the NAM.

SSCOFS relies on the Global Real-Time Ocean Forecast System (G-RTOFS) to provide open boundary temperature, salinity and sub-tidal water level, and North Pacific Tidal Database (ENPAC2015) from the ADvanced CIRCulation (ADCIRC) model is used to generate tidal forcing. The National Water Model's river discharge outputs provide freshwater inputs at the selected rivers.

Similar to the existing OFS, SSCOFS has two types of NetCDF output files. One is a field/gridded file with a 1-hour time interval and the other is a station/point output file with a 6-minute time interval. In these files, water level, water temperature, water salinity and currents are the model output variables. Other variables, such as wind speed and heat flux, which are used to drive the model, are also included in the files.

New SSCOFS Product Outputs:

Gridded fields and station/point nowcast/forecast guidance will be available on the CO-OPS THREDDS server:

<http://opendap.co-ops.nos.noaa.gov/thredds/catalog.html>

and on NCEP Web services under sscofs.YYYYMMDD:

<https://nomads.ncep.noaa.gov/pub/data/nccf/com/nosofs/v3.6>
<https://nomads.ncep.noaa.gov/pub/data/nccf/com/nosofs/prod>
<https://ftpprd.ncep.noaa.gov/data/nccf/com/nosofs/v3.6>
<https://ftpprd.ncep.noaa.gov/data/nccf/com/nosofs/prod>
<ftp://ftpprd.ncep.noaa.gov/pub/data/nccf/com/nosofs/v3.6>
<ftp://ftpprd.ncep.noaa.gov/pub/data/nccf/com/nosofs/prod>

Parallel data will be available in the following locations:

<https://nomads.ncep.noaa.gov/pub/data/nccf/com/nosofs/v3.6>
<https://nomads.ncep.noaa.gov/pub/data/nccf/com/nosofs/para>
<https://ftpprd.ncep.noaa.gov/data/nccf/com/nosofs/v3.6>
<https://ftpprd.ncep.noaa.gov/data/nccf/com/nosofs/para>
<ftp://ftpprd.ncep.noaa.gov/pub/data/nccf/com/nosofs/v3.6>
<ftp://ftpprd.ncep.noaa.gov/pub/data/nccf/com/nosofs/para>

Note: The ftpprd link only works for FTP-enabled web browsers.

Where YYYYMMDD is year, month, and day.

In addition to the model's output files, its input files can also be found in the above ftp site. The input files' names also follow the new file naming convention as previously mentioned.

Model Input Files:

Initial files for nowcast:

sscofs.t{CC}z.{YYYYMMDD}.init.nowcast.nc

Surface meteorological forcing files:

sscofs.t{CC}z.{YYYYMMDD}.met.nowcast.nc

sscofs.t{CC}z.{YYYYMMDD}.met.forecast.nc

sscofs.t{CC}z.{YYYYMMDD}.hflux.nowcast.nc

sscofs.t{CC}z.{YYYYMMDD}.hflux.forecast.nc

OBC forcing files:

sscofs.t{CC}z.{YYYYMMDD}.obc.nc

River forcing files:

sscofs.t{CC}z.{YYYYMMDD}.river.nc.tar

Runtime input files:

sscofs.t{CC}z.{YYYYMMDD}.nowcast.in

sscofs.t{CC}z.{YYYYMMDD}.forecast.in

Log files:

sscofs.t{CC}z.{YYYYMMDD}.corms.log
sscofs.t{CC}z.{YYYYMMDD}.jlogfile.log
sscofs.t{CC}z.{YYYYMMDD}.nowcast.log
sscofs.t{CC}z.{YYYYMMDD}.forecast.log

Other:

sscofs.status

SSCOFS web product is displayed on the CO-OPS webpage:

<https://tidesandcurrents.noaa.gov/ofs/sscofs/sscofs.html>

Additional information about SSCOFs will be available after operational implementation at:

https://tidesandcurrents.noaa.gov/ofs/sscofs/sscofs_info.html

SSCOFS predictions are used by commercial and recreational mariners; fishermen; emergency managers; search and rescue responders and NWS marine weather forecasters. The development and implementation of SSCOFs was funded by the Coastal and Ocean Modeling Testbed (COMT) as a joint project of the NOS/Center for Operational Oceanographic Products and Services (CO-OPS), the NOS/Office of Coast Survey (OCS), the Pacific Northwest National Laboratory (PNNL), the U.S. Integrated Ocean Observing System (IOOS), IOOS Regional Association in Pacific Northwest (NANOOS), the FVCOM development group at the University of Massachusetts, Dartmouth, and NCO.

SSCOFS products are monitored 24 x 7 by both NCO and CO-OPS Continuous Operating Real-time Management System (CORMS) personnel.

NCEP urges all users to ensure their decoders can handle changes in content order and volume changes. These elements may change with future NCEP model implementations. NCEP will make every attempt to alert users to these changes before implementation.

As part of NCEP's standard 30-day parallel testing, the new output products will be available here:

<https://nomads.ncep.noaa.gov/pub/data/nccf/com/nosofs/v3.6>

<https://nomads.ncep.noaa.gov/pub/data/nccf/com/nosofs/para>

<https://ftpprd.ncep.noaa.gov/data/nccf/com/nosofs/v3.6>

<https://ftpprd.ncep.noaa.gov/data/nccf/com/nosofs/para>

<ftp://ftpprd.ncep.noaa.gov/pub/data/nccf/com/nosofs/v3.6>

<ftp://ftpprd.ncep.noaa.gov/pub/data/nccf/com/nosofs/para>

Any questions, comments or requests regarding this implementation should be directed to the contacts below. We will review any feedback and decide whether to proceed.

If you have any questions concerning these changes, please contact:

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For questions regarding the dataflow aspects, please contact:

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National Service Change Notices are online at:

<https://www.weather.gov/notification/>

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