



Development of the Unified Post Processor (UPP) to Generate GEFS and SFS Products



Wen.Meng@noaa.gov

Wen Meng¹, Huiya Chuang¹, Bing Fu¹, Li Pan², Li Zhang^{4,5}, Yali Mao⁴, Chris Hill², Jun Du¹, Karina Asmar³,
Jesse Meng¹, Xiaqiong Zhou¹, Weizhong Zheng², Jason Levit¹, Fanglin Yang¹
1, NOAA/NCEP/EMC; 2, Lynker at NOAA/NCEP/EMC; 3, Axiom at NOAA/NCEP/EMC; 4, CU/CIRES; 5, NOAA/OAR/GSL

GEFS v13 Product Generation from UPP

The baseline GEFS v13 meteorological product list from UPP has been established, including 579 fields—512 for upper air, 67 for surface and other categories. The testing of aerosol and chemical product list is on-going. New requests from GEFS community can be considered based on evaluations from the model side, UPP side, and the workflow side.

Product Update Highlights

- Add capability to include ensemble member information for aerosol/chemical products
- Update turbulence products based on NCAR GTG-4
- Introduce new foundation temperature
- Add new winter snow accumulation products
- Enhancement to process the outputs of GEFS-aerosol model, UFS-aerosol model and UFS-Chem model
- Replacement of operational SREF products

Product GRIB2 ID Updates

- Low level cloud cover: TCDC -> LCDC
- Middle level cloud cover: TCDC -> MCDC
- High level cloud cover: TCDC -> HCDC
- Sea level pressure: PRES -> PRMSL

Product Unification

- Unified algorithms to process all UFS-based models: RH, Visibility, Gust wind and ceiling

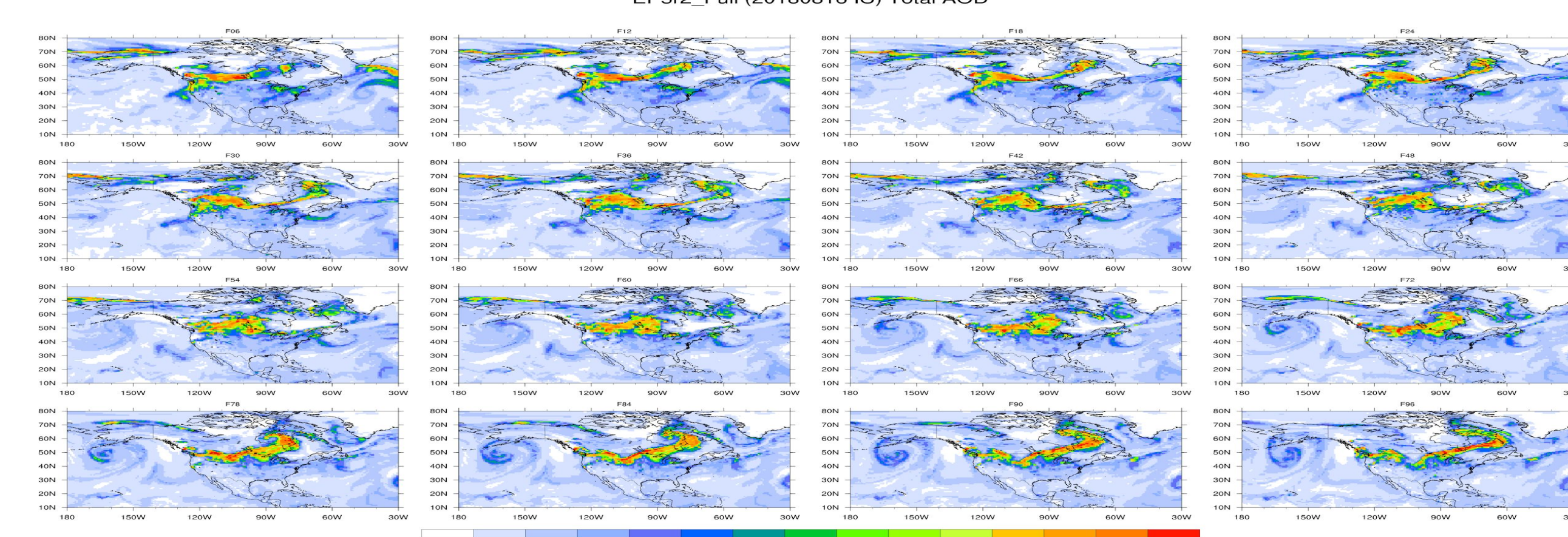
GRIB2 metadata update for ensemble aerosol/chemical products

AOTK:entire atmosphere:18 hour fcst:aerosol=Total aerosol
COLMD:entire atmosphere:18 hour fcst:aerosol=Sea salt dry
PMTF:1 hybrid level:18 hour fcst:aerosol=Sea salt dry



AOTK:entire atmosphere:18 hour fcst:ENS=+7:aerosol=Total aerosol
COLMD:entire atmosphere:18 hour fcst:ENS=+7:aerosol=Sea salt dry
PMTF:1 hybrid level:18 hour fcst:ENS=+7:aerosol=Sea salt dry

EP5r2_Full (20180816 IC) Total AOD

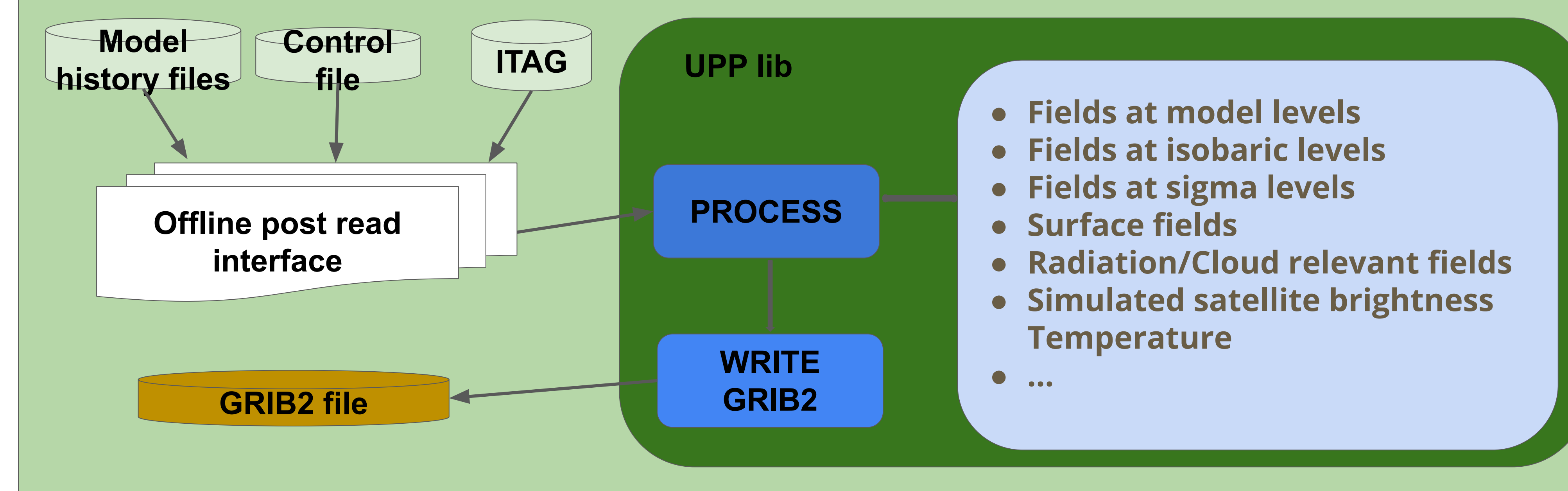


courtesy of Partha Bhattacharje

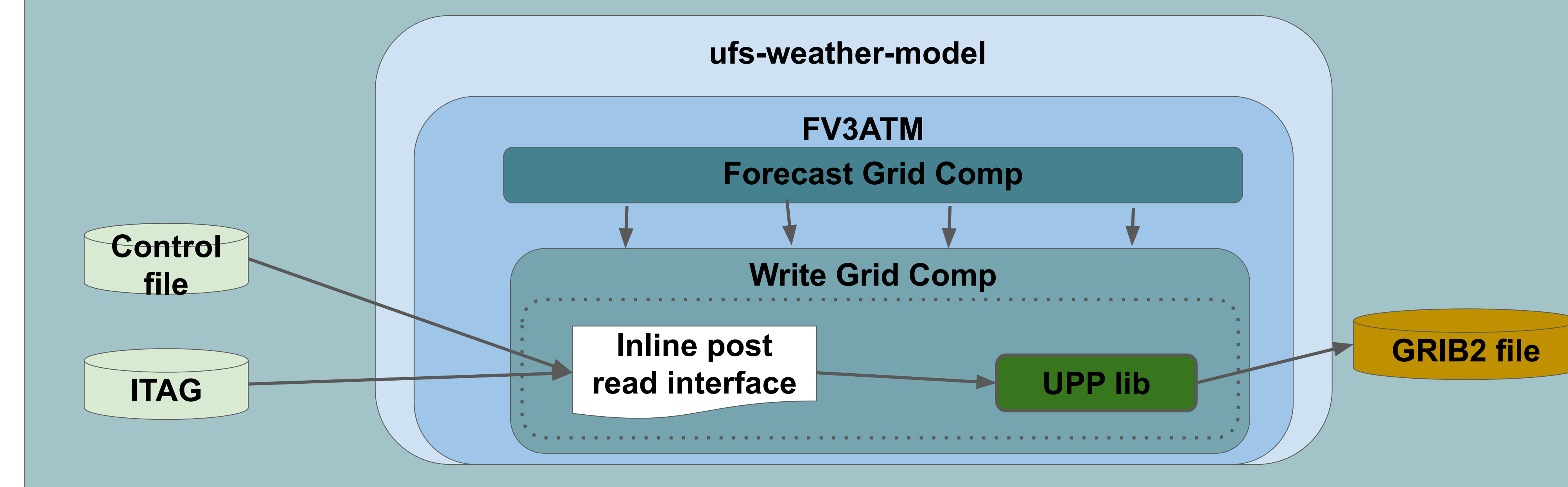
Overview UPP

- Process all UFS-based model ATM component output
- Read model output in NETCDF/NEMSIO format and Write out GRIB2 format
- Perform vertical interpolation onto isobaric and other non-model surfaces
- Do not perform horizontal interpolation
- Compute commonly used and value-added diagnosis fields (e.g. CAPE/CIN, RH, vorticity, heat index)
- Allow users to tailor their outputs by selecting from over 1000 available GRIB2 products
- Ported to several platforms, including NCEP operational supercomputer, various UFS-supported R&D platforms, and the NOAA Cloud platform
- Two ways of running UPP
 - Offline post mode: Operate as a standalone component to ingest UFS model output and conduct post processing
 - Inline post mode: Function as a library and is configured as a sub-component within ufs-weather-model
 - Reduce I/O activity significantly by passing forecast data through memory for post processing
 - Speed up the entire forecast system and generate more accurate products

Offline post



Inline post



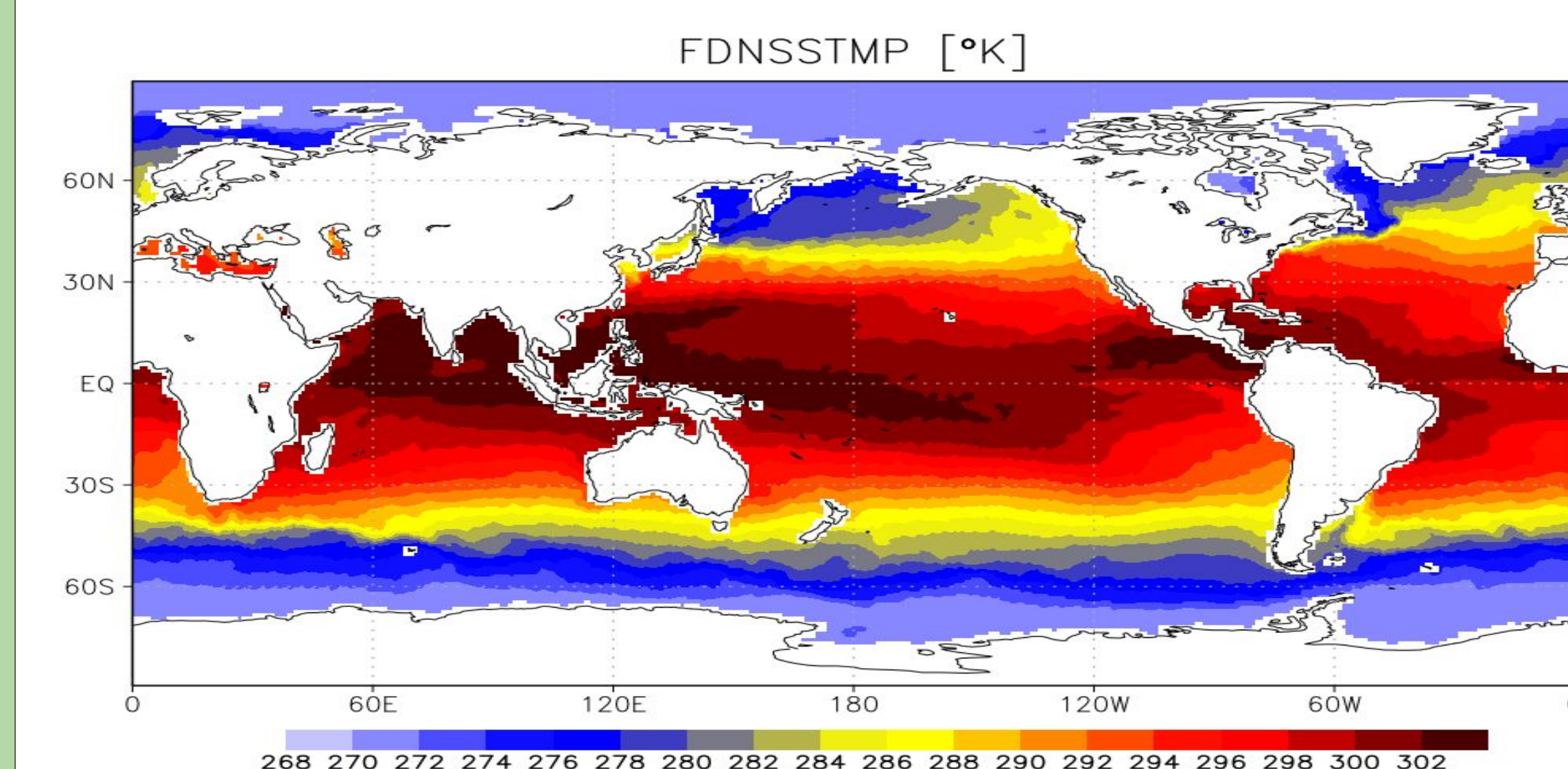
SFS v1 Product Generation from UPP

The baseline SFS v1 meteorological product list from UPP has been established, including 456 fields – 392 for upper air, 64 for surface and other categories. The initial requests and inquiries from SFS model developers and the main stakeholder CPC have been addressed. New requests from SFS community will be considered based on assessments from the model side, UPP side, and the workflow side.

****Refer to Karina's poster for details****

Product Update Highlights

- Output HGT/T/U/V/RH/SPFH/O3MR/ABSV on isobaric levels up to 0.01 Pha
- Vertical Velocity in pressure coordinates calculated from the model, which is configured as hydrostatic daycore mode
- Introduction of new runoff, helicity, surface direct solar radiation products
- New temporal 10-m max wind products
- New streamfunction and velocity potential
- Replacement of operational CFS products



courtesy of Lydia Stefanova

UPP Access

- The UPP Repository is managed on github and distribute as a community post processor through collaboration with EPIC (Earth Prediction Innovation Center)



<https://github.com/NOAA-EMC/UPP>