# VIIRS Atmospheric Products in the Community Satellite Processing Package (CSPP)

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## Overview

The Cooperative Institute for Meteorological Satellite Studies (CIMSS) has a long history of supporting the Direct Broadcast (DB) community for various sensors, recently with the International MODIS/AIRS Processing Package (IMAPP) for the NASA EOS polar orbiters Terra and Aqua. CIMSS has continued this effort into the NPP/JPSS (previously NPOESS) era with the development of the Community Satellite Processing Package (CSPP), supporting the Suomi NPP VIIRS, CrIS and ATMS sensors. In time it is intended that CSPP will support GOES-R, JPSS and other geostationary and polar orbiting platforms.

In this poster we will focus on the implementation and usage of the the VIIRS Cloud Mask (VCM) sub-package within CSPP, which is based on the Interface Data Processing Segment (IDPS) code as implemented by Raytheon in the Algorithm Development Library (ADL). VIIRS Scientific Data Record (SDR) files are ingested in HDF5 format and converted to the internal Binary Large Object (BLOB) files with matching text file metadata. The manipulation and handling of these BLOB files, the acquisition and conversion of the various ancillary data formats into the internal BLOB format, and the output VCM is described.

## Algorithm Development Library (ADL)

- The core of CSPP is ADL, a collection of pre-compiled `C++` binaries for the various NPP Suomi sensor SDR algorithms, as well as for the derived products (e.g.: VIIRS Cloud Mask), and the associated ancillary processing.
- The VIIRS Cloud Mask (VCM) is generated by executing the executable `ProEdrViirsMasksController.exe`, the configuration options for which are read from a series of `XML` files.
- The `XML` file for a particular controller specifies input and output paths, as well as listing other controller executables which are prerequisites, such as the various ancillary controllers for granulating global gridded datasets.
- Typically the VCM would be generated by first running the VIIRS SDR controller, which generates the VIIRS SDR (radiometric files and geolocation) from the Raw Data Records (RDRs). The SDR controller also encompasses the generation of the granulated ancillary data, which are then available to any subsequent Environmental Data Record (EDR) controllers such as for the VCM.
- For the standard setup, it is not easy to decouple the generation of the VIIRS SDR products and the generation of the ancillary data required by later EDR controllers. It is desirable to execute the SDR, ancillary and EDR generation as separate processes to aid in algorithm development and calibration/validation efforts.

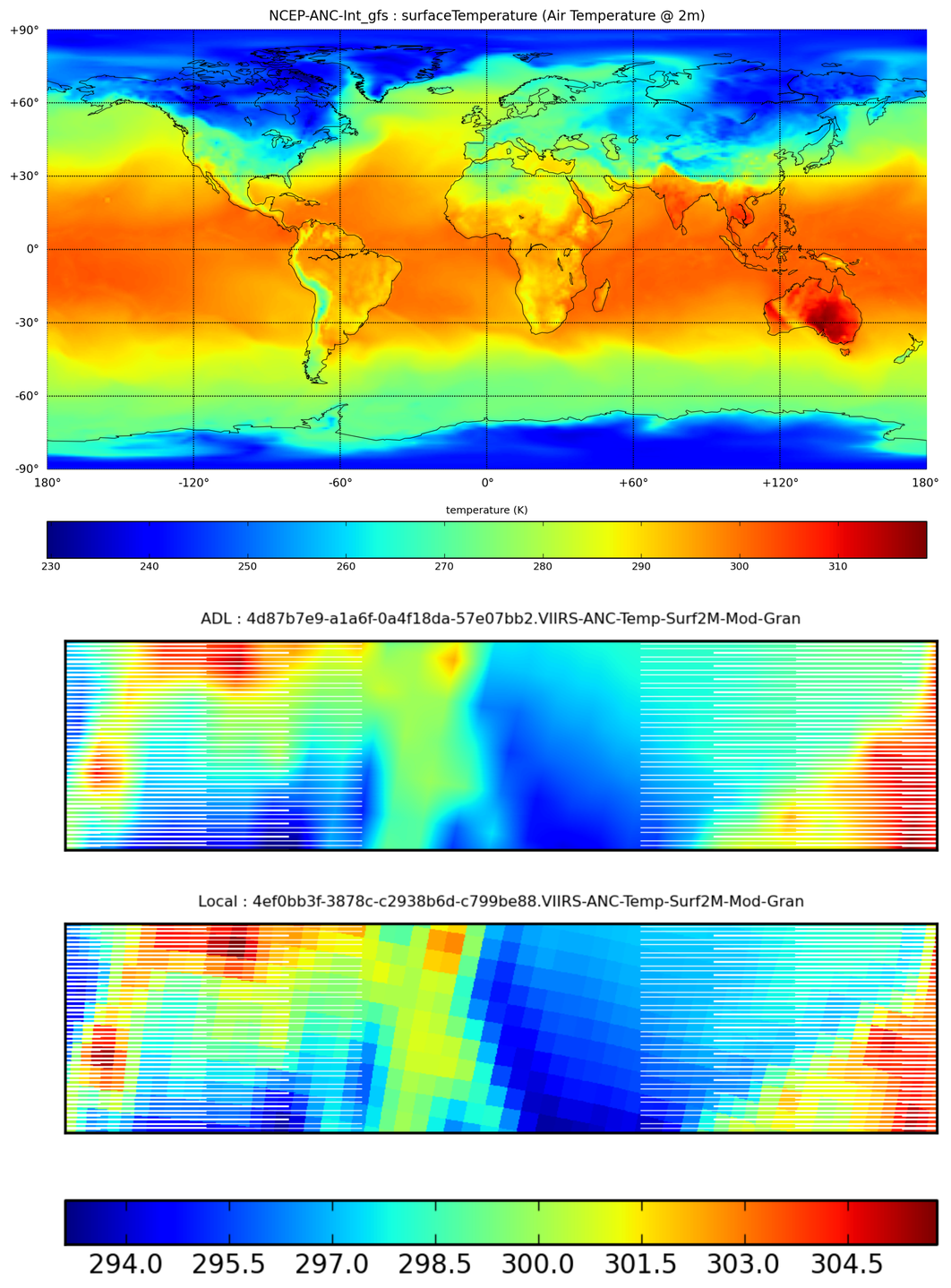
## CSPP Software Stack

- CSPP is a set of open source tools, primarily `python` and `bash` scripts and related tools, which configure the required inputs for ADL, and handle any required postprocessing of the outputs.
- A `python` script provides the required interface between the user and the required ADL controller, taking various command line options. The script uses these options to generate the required `XML` files which reflect these options, and configure the execution of the ADL controller.
- Central to the CSPP software stack is a custom python distribution called ShellB3. ShellB3 is configured to contain only what is necessary for driving the various ADL controllers, and is intended to be a portable drop-in python environment for executing CSPP with little or no user setup.

## Examples

- Shown at upper right (CSPP Ancillary Granulation) is an example of ancillary data on a global grid as retrieved from the primary source (NCEP GFS grib in this case) (top), granulation performed by the ADL ancillary controller as part of the VIIRS SDR generation (center), and the same granulation as performed by the CSPP python tools (bottom). CSPP uses nearest-neighbour granulation Different granulation schemes will be included in future releases.
- Shown at lower right (Comparison of Truth and CSPP Cloud Mask) is the VCM generated by ADL using ancillary data generated by the appropriate ADL controller (top), by CSPP using ancillary data generated by CSPP python tools (center), and the difference between the two (bottom). The primary source of disagreement is the difference in granulation method, which is most apparent at coastlines, rivers, and other sharp boundaries. The example granule is centered over the Ganges Delta in Bangladesh.

## CSPP Ancillary Granulation




## Comparison of Truth and CSPP Cloud Mask