

## CCMP V2.0 Wind Product Released January 7th, 2015

Available at [www.remss.com/measurements/ccmp](http://www.remss.com/measurements/ccmp)

### PRODUCT DEVELOPMENT

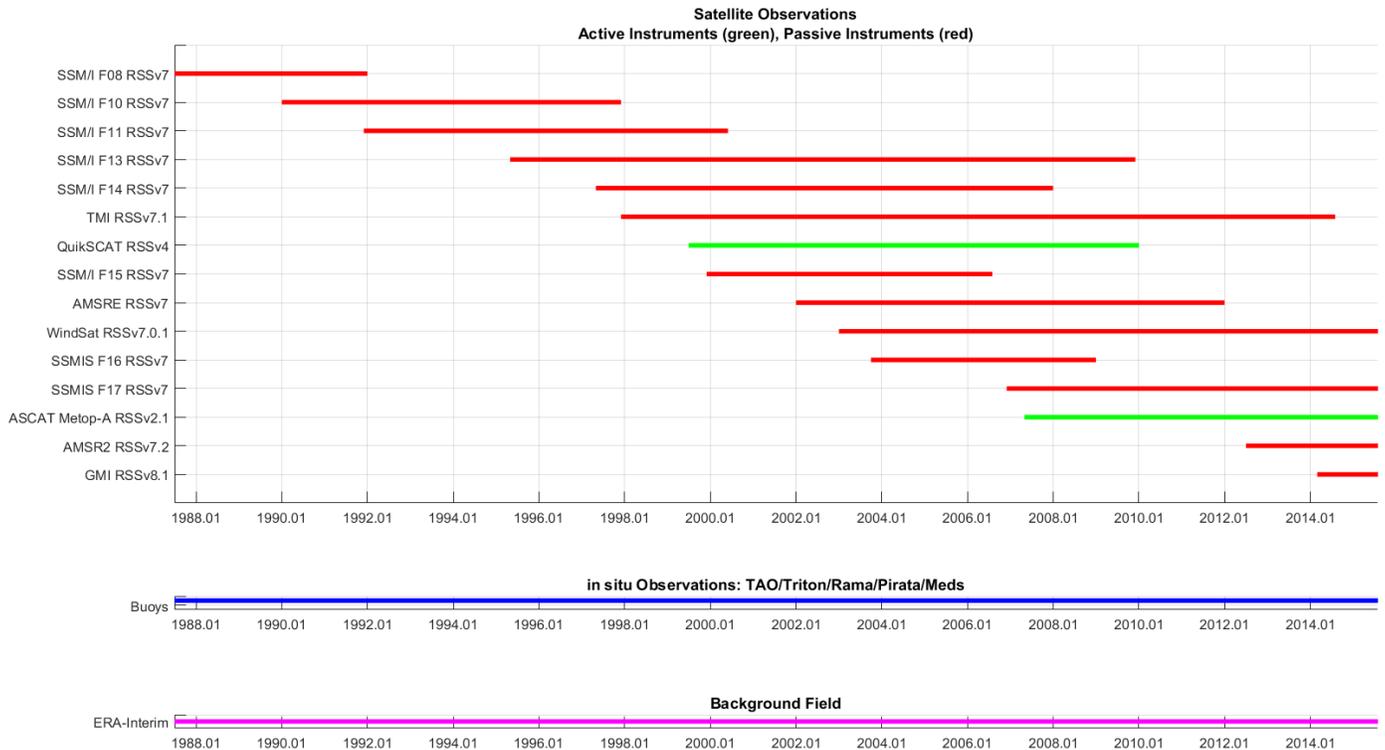
The CCMP data set combines cross-calibrated satellite microwave winds and instrument observations using a Variational Analysis Method (VAM) to produce high-resolution (0.25 degree) gridded analyses. Satellite wind retrievals derived by Remote Sensing Systems from a number of satellite-borne passive and active microwave instruments are used. RSS intercalibrates radiometers at the brightness temperature level to within 0.2 degree Celsius, applying a refined sea-surface emissivity model and radiative transfer function to derive surface winds. The resulting wind retrievals are highly consistent between microwave radiometer instrument platforms, including SSM/I, SSMIS, AMSR, TMI, WindSat, and GMI. RSS has also developed a geophysical model function for deriving wind speeds and directions from microwave scatterometers, including QuikSCAT and ASCAT. Both radiometer and scatterometer data are validated against ocean moored buoys, which confirm the measurements are in agreement (to within 0.8 m/s) despite the difference in wind measurement and retrieval methodologies. The VAM combines RSS instrument data with moored buoy measurements and a starting estimate (first-guess) of the wind field. The European Center for Medium-Range Weather Forecasts (ECMWF) ERA-Interim Reanalysis winds are used in the CCMP V2.0 processing as the first-guess wind field. This 0.25 deg model wind field is consistently processed, as opposed to that of the ECMWF operational model for which the model changes over time. All wind observations (satellite and buoy) and model analysis fields are referenced to a height of 10 meters.

RSS now completes maintenance, update, and continued processing of CCMP. Once the transition was confirmed to be accurately functioning, RSS conducted a full reprocessing of the CCMP data set. The version changes associated with the RSS V2.0 CCMP release include:

- Use of uniform inputs and satellite retrievals, with all satellite winds produced using RSS Version-7 (or higher) Ocean Radiative Transfer Model (ORTM) and a consistent processing methodology.
- Extension of the CCMP data set to July 2015 with plans to provide bi-annual extensions and updates to the dataset.
- Addition of winds from new instruments: ASCAT Metop-A, AMSR2, and GMI.
- Upgrade of the first-guess background wind field. Now using the 0.25-deg, 6-hourly ERA-Interim Reanalysis winds.
- Use of improved moored buoy data with better quality control, including winds from NDBC, TAO, TRITON, RAMA, PIRATA, and Canadian buoys.
- Upgrade of the data file format to netCDF4 with CF-1.6 metadata. Each daily file contains four 6-hourly wind analyses and self-describing metadata.

Figure 1 shows the satellite data incorporated into the VAM. Passive radiometers are plotted in red and active scatterometers are plotted in green. The version of data used for each instrument is provided on the left. The moored buoy winds and ERA-Interim Reanalysis winds are available for the entire data range. Quality controlled buoy data have been obtained from the Pacific Marine

Environmental Lab (PMEL), from the National Data Buoy Center (NDBC), and from the Fisheries and Ocean Canada Oceanography and Scientific Data branch (OSD).



## DATA PRODUCT FORMAT

The CCMP V2.0 Level-3 (L3) winds are available as netCDF-4 data files. Each daily data file contains 3 arrays of size 1440 (longitude) by 628 (latitude for range -78.375 to 78.375) by 4 (time of 0Z, 06Z, 12Z, 18Z). Two of the arrays are the U and V wind components in meters/second (m/s). Standard U and V coordinates apply, meaning the positive U is to the right and positive V is above the axis. Winds in the CCMP product are of oceanographic convention, meaning a wind blowing toward the Northeast has a positive U component and a positive V component. The third array in the file is the number of observations used to derive the wind components. A number of obs value of 0.0 means that the wind vector for that grid cell was obtained from the background field only as no satellite or moored buoy wind data were available.

A fill value of -9999.0 is used for any grid cell without any data. This should rarely happen. Longitude is given in degrees East from 0.125 to 359.875 and latitude is given in degrees North with negative values representing southern locations. While this is referred to as a global wind product, the extent of the data is -79 degrees to 79 degrees latitude. The time in the file is given as hours since midnight on Jan 1, 1987.

The netCDF file contains CF 1.6-compliant self-describing metadata. The JPL metadata compliance

checker was used to assess compliance. The RSS CCMP V2.0 data set is only distributed as L3 files. The V1.1 CCMP data set available from PO.DAAC also contained V2.5 (vectors on satellite data) and V3.5 (Pentad and Monthly data) products. However, RSS has chosen to not distribute the L2.5 and L3.5 products at this time.

File names have the structure CCMP\_Wind\_Analysis\_YYYYMMDD\_V02.0\_L3.0\_RSS.nc where YYYY is the 4-digit year, MM the month and DD the day-of-month. The files are stored in v02.0/Yyyyy/Mmm/ directory structure.

The CCMP netCDF4 files can be explored using tools such as Panoply or ncBrowse. Matlab, IDL, and Python have built-in routines for reading netCDF files. No sample read routines have been provided for these files as they are self describing.

**For more information about the CCMP data product,** see the web page

[www.remss.com/measurements/ccmp](http://www.remss.com/measurements/ccmp)

If you have questions about the data or problems with data access, please contact Remote Sensing Systems at [support@remss.com](mailto:support@remss.com)

Please cite use of these data in your publications. Continued production of this data set requires support from NASA. We need you to be sure to cite these data when used in your publications so that we can demonstrate the value of this data set to the scientific community.

Please include the following statement in the acknowledgement section of your paper:

"CCMP Version-2.0 analyses are produced by Remote Sensing Systems and sponsored by NASA Earth Science funding. Data are available at [www.remss.com](http://www.remss.com)."

**Formal citation:**

Wentz, F.J., J. Scott, R. Hoffman, M. Leidner, R. Atlas, J. Ardizzone, 2015: Remote Sensing Systems Cross-Calibrated Multi-Platform (CCMP) 6-hourly ocean vector wind analysis product on 0.25 deg grid, Version 2.0, [indicate date subset, if used]. Remote Sensing Systems, Santa Rosa, CA. Available online at [www.remss.com/measurements/ccmp](http://www.remss.com/measurements/ccmp). [Accessed dd mmm yyyy]. \*Insert the appropriate information in the brackets.