AQUARIUS/SAC-D

Aquarius Validation Data System (AVDS) pre-processing of co-located in situ surface salinity validation data for Level 2 Aquarius data files.

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Data Version 5.0

AQUARIUS/SAC-D

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1. Introduction:

Aquarius data Version 5 differs from earlier data releases by including co-located in situ validation data in the Level 2 (L2) file structure at the locations and times where such co-locations exist. The processing was done with the Aquarius Validation Data System (AVDS) at Earth and Space Research (ESR). The data were then transferred to the Aquarius Data Processing System (ADPS) at NASA/GSFC and inserted into the L2 files.

This memo describes the AVDS methodology and criteria for determining these satellite-in situ match-ups. Hereafter, the term "match-up" and 'co-location" have the same meaning.

2. Methodology

The following describes the method used in the creation of V5.0 AVDS match-ups (co-located with satellite footprint) and which are used for on-going validation of the Aquarius L2 and L3 data products. The technique is based on Bailey and Werdell ('A Multi-Sensor Approach for the On-Orbit Validation of Ocean Color Satellite Data Products',2006) and on development of the AVDS system developed by G.Lagerloef, H.Kao, J.Gunn and J.Lilly of Earth and Space Research (ESR),

The AVDS match-up process relies on the pairing of 'trusted'' in situ SSS observations (typically Argo floats) against which individual Aquarius salinity measurements are compared and statistics are calculated. Argo data are downloaded weekly in order to capture the highest quality data following quality control (QC) updates from ARGO PIs and data centers. For each nominal date, in situ files are aggregated and relevant data (temperature, pressure and salinity) is extracted as a subset of the float profile, retaining only the top (shallowest) profile data provided that profile depth is 5 m or less. This extracted daily data is then stored in an in situ 'database' for use in creation of AVDS matchups.

The AVDS matching process is "in situ centric" in that the Argo observation is used as the spatial and temporal reference for determining the pairing. Prior to the actual determination of the match-up pairing, a 'smoothed' Aquarius SSS field is created for each measurement by averaging the measured values forward and backward for five (5) individual along-track salinity measurements, yielding an averaged value of 11 measurements centered on any individual salinity measurement.

The actual match-up generation process begins by iterating through all in situ observations for that date and pairing each with the Aquarius measurement with the 'closest point of approach' (CPA) of each bore-sight path and the in situ data point. The selection also satisfies these basic criteria:

- the spatial separation between the bore-sight center of the beam footprint and the in situ observation ≤ 75km
- the measurement is within +/- 3.5 days from the nominal date of the in situ observations (~ 84 hours)

- that the Aquarius SSS measurement falls within a minimum/maximum range (20 – 50 PSU)
- that the HH wind speed for the L2 measurement <= 15 m/s
- that the calculated radiometer land and ice fractions found in the measurement are both ≤ 0.001

The AVDS processing for the Aquarius data V5 release found an average of about 36 match-ups per orbit file (granule).   The distribution is skewed, and is illustrated in Figure 1.
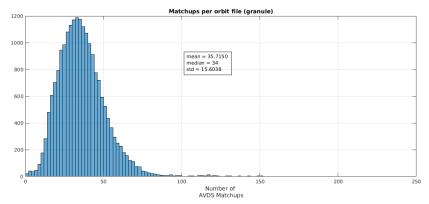

Figure 1 Distribution for the number of match-ups recorded per orbit, accumulated over all the L2 orbit granule data files.

Once the match-up pairing has been determined, a subset of constituent fields from both the in situ observations and Aquarius measurements are saved as the match-up record. Notably, the match-up data preserves the full set of Aquarius radiometer flags for a given salinity measurement, allowing match-up data sub-setting or quality control to be applied by the individual investigator at a later time.

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