Matchup Characteristics of Sea Surface Salinity Using a High-Resolution Ocean Model

Median Number of SMAP L2 Matchups

RMSD of Simulated SMAP and Argo Floats' SSS

RMSD of Simulated SMAP 0.2 Noise and Argo Floats' SSS
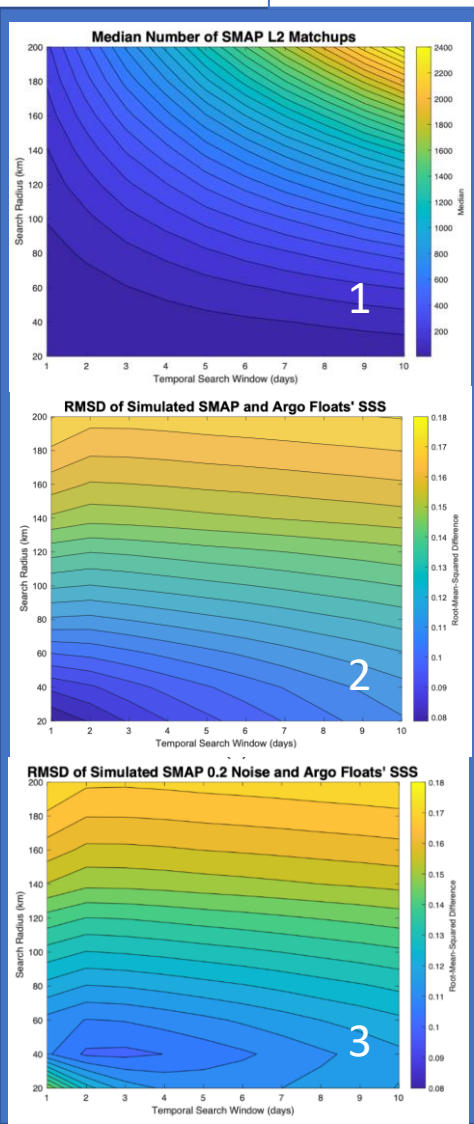
Problem: Sea surface salinity (SSS) satellites generate data that need to be validated, that is compared with in-water (in situ) measurements, to ensure their accuracy. These measurements are mainly Argo floats, which are single point values taken at random times and places and may not coincide with satellite passes. To make the comparisons, the satellite measurements need to be matched with in situ ones in some way. These are called "matchups". Matchup comparisons are used to compute errors and to understand the validity of the satellite data.

Data and results: We used a 1-year run of a high-resolution (~ 2 km) ocean model. We sampled the model as if the Aquarius and SMAP satellites were flying over it and Argo floats were making profiles within it. The matchup method we choose here is to average all satellite measurements within a given time and space window relative to each in situ one. Figure 1 shows the median number of level 2 (L2) SMAP observations per float as a function of time and space window. This number is large, and increases with time and space window. Figure 2 measures the difference between the float value and the average simulated SMAP value as a function of time and space window. We also tried adding some random noise to the L2 satellite observations to simulate the error associated with the retrieval process (Figure 3).

Broader significance or implications: Figure 2 gives us an estimate of how much influence the matchup time/space window has on the computed errors, i.e. differences between float and satellite values. It is clear from this that the size of the space window is more influential than that of the time window. The experiment with added noise (Figure 3) found an optimum time and space matchup window at around 2-4 days and 40 km. Using this information we can optimize the matchup process and produce estimates of satellite error that have a minimum value.