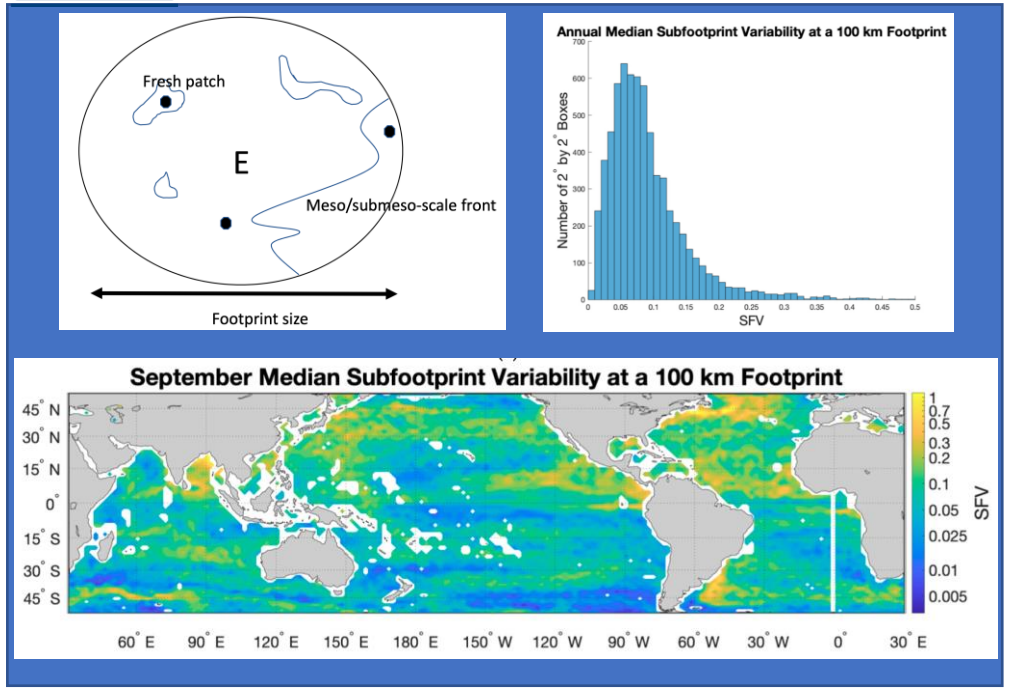
Sea Surface Salinity Subfootprint Variability from a Global High-Resolution Model



Upper left: Schematic showing a satellite footprint, some characteristic SSS variability, the estimation point for the satellite ("E") and three in situ measurements which may be compared to the satellite to determine accuracy.
Upper right: Distribution of annual median SFV.
Lower panel: A map of median SFV for the month of September. This shows where SFV is large (yellow color) or small (blue).

Problem: Sea surface salinity (SSS) satellites have a large footprint (40-100 km) due to the way in which they make their measurements. The satellite makes an average over this footprint, but ignores potentially significant variations within it, so called subfootprint variability (SFV). Verifying the accuracy of satellite measurement requires comparison with *in situ* instruments like Argo floats, but these may differ due to SFV and not measurement error.

Data and methods: We used a high-resolution (~2 km) ocean model to determine SFV, the standard deviation within a satellite footrpint. The model run was one year long and covered the global (non-Arctic) ocean. SFV time series were computed on a 2°X2° evaluation grid over the one-year run.

Key findings: SFV varies in time and space over the globe. It tends to be higher in the fall in each respective hemisphere than in the spring, high near western boundary currents such as the Gulf Stream and in the tropics.

Broader significance or implications: SFV is a significant source of mismatch between satellite and *in situ* observations, and this study quantifies it on a global basis, at least to the extent that the model is able to simulate SSS. The seasonal changes in SFV bring up the question of *why* it varies in time and space. We speculate that SFV is generated in the open ocean mainly by heavy rainfall, which also peaks in the fall.

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