On assessing ERA5 and MERRA2 representations of cold-air outbreaks across the Gulf Stream

Key Findings:
• Reanalysis surface fluxes and boundary layers are representative of observations to first-order, sufficient for higher-resolution model initialization.
• Reanalyses represent the Gulf Stream more broadly than is seen in nature, contributing to turbulent flux and boundary layer biases.
• Previously-noted thermodynamic and dynamic biases reinforce (ERA5) or compensate (MERRA2) surface fluxes but support realistic winter boundary layer heights.

Figure: Dropsondes, from the NASA ACTIVATE winter 2020 campaign, assess reanalyses representations (reanalysis - dropsonde profiles with ERA5 in red and MERRA2 in green) of cold-air outbreaks across the warm Gulf Stream current. (Terra MODIS visible imagery and high-resolution sea surface temperatures (GHRSST) for 1 March 2020 from NASA Worldview. Dropsonde data available through doi:https://doi.org/10.5067/ASDC/ACTIVATE_MetNav_AircraftInSitu_KingAir_Data_1. )