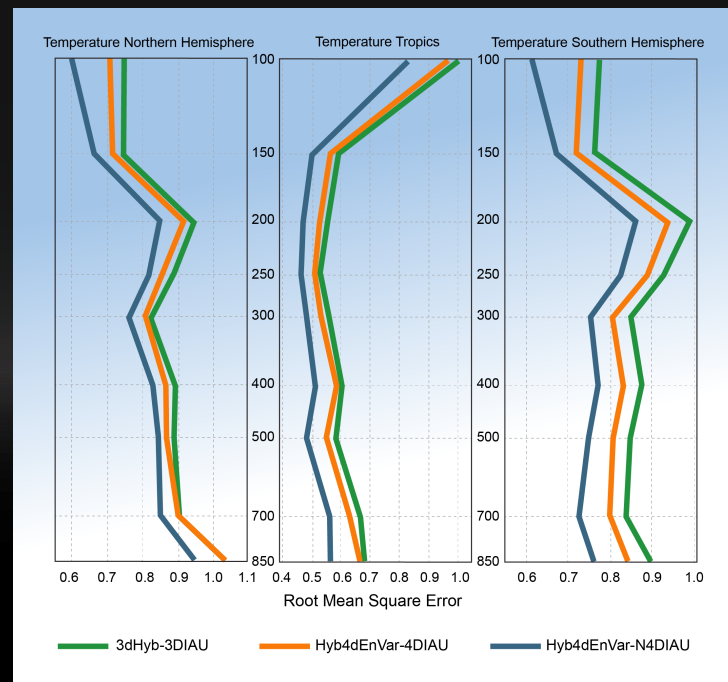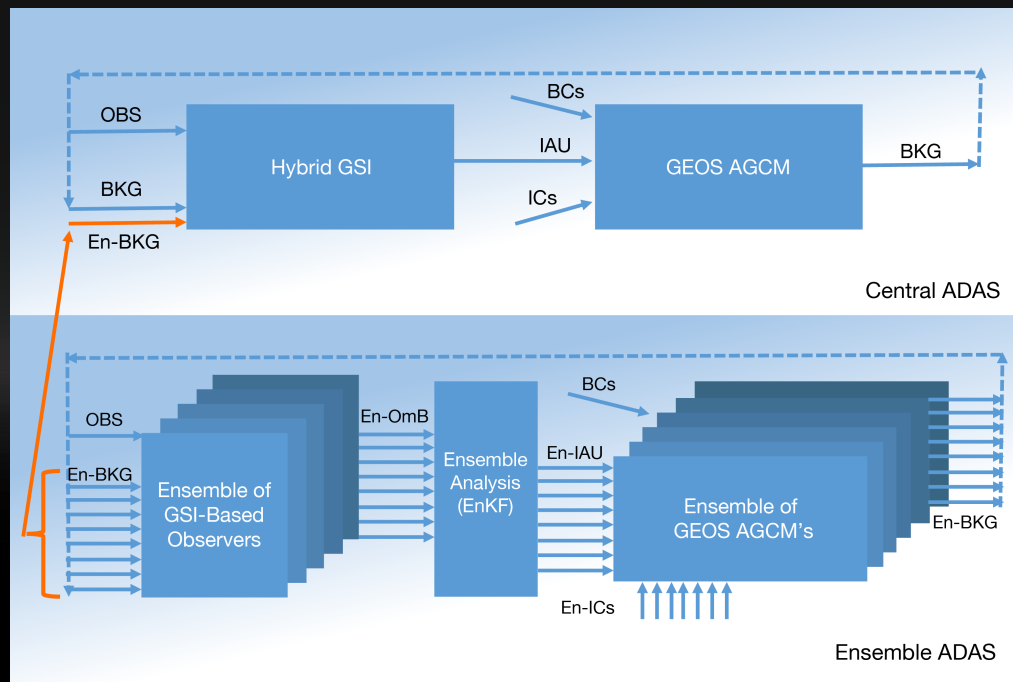# GMAO's Hybrid Ensemble-Variational System Gets an Upgrade



In early 2017, GMAO upgraded the GEOS FP (forward processing) data assimilation system from a Hybrid 3D Ensemble-Variational to a Hybrid 4D Ensemble-Variational (Hyb-4DEnVar) approach. The schematic (**LEFT**) illustrates the Hyb-4DEnVar approach to data assimilation. The results (**RIGHT**) show that the root-mean-square error in temperature in the Hyb-4DEnVar system is smaller than in the 3D system and is further improved by adding a "nudging" approach to the analysis forcing.