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Session 9B Paper 2
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IDA2017 – A Next-Generation Coupled Modeling and Data Assimilation Package

IDA2017 is a next-generation, multi-model, multi-instrument assimilation software package developed at APL. The code is fully modular, allowing for physics-based and empirical models to interact with data assimilation algorithms in a coupled framework. IDA2017 produces a single, integrated estimate of the upper atmosphere by coupling ionospheric assimilation (GPS, HF arrays, in-situ densities, ground and space-borne optical instrumentation into IRI) with thermospheric wind estimation (through reverse engineering), thermospheric composition assimilation (from SSUSI and GUVI observations) and a physics-based ionospheric predictive model.

The ionospheric community has a large number of empirical and physics-based models and datasets, but there is a high overhead in building, downloading data, running, integrating and plotting the output. IDA2017 addresses this problem with a single overarching makefile and a single configuration file containing all the settings.

Newly developed code for this effort includes the composition assimilation module “Compass,” which estimates the global thermospheric neutral density distribution from SSUSI and GUVI observations of O/N2 ratio (135.6-nm and LBH-band emissions) and the MSIS neutral atmosphere model. Compass includes a Gauss-Markov advance code to allow predictive estimation of neutral density.

Results of the new IDA2017 package will be presented showing estimates of coupled ionospheric and thermospheric dynamics.