2014 Workshop: OSSES for Data Assimilation

Long title
Planning Observing System Configurations for Answering Geospace System Science by Utilizing Simulation and Data Assimilation
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Description

This proposed workshop is year two of the 3 year workshop series proposed in 2013. The overall goals of the three years of this OSSE worksop are to: a) define a set of OSSE simulations that relate to a current or planned mission or experiment b) define the model simulations and the simulated data for the OSSE simulations c) carry out data assimilation on the simulated observations from a number of different institutions d) assess the impact of the observations on the assimilation by using several metrics defined by the workshop team. The overall focus is to study the impact of various data sets from ground and/or space based instrumentation upon data assimilative algorithms from a basic science point of view, with a focus on the system science areas described in the justification above.

During the first workshop we identified a mission -- the NASA ICON mission; identified candidate models for "truth" simulations, the set of observations we wanted to simulate; and metrics for validation. The stated objective of the OSSE was to study the additional uses of ICON data sets in global ionospheric data assimilation models. A further rationale was a study of an already well defined mission would allow us to develop an OSSE template for future studies.

The action items taken were to carry out the OSSE simulations for the "truth" IT system, simulate the observations, and distribute them to various researcher who have data assimilation algorithms. These researchers will run their algorithms on the simulated observations, and use the metrics to assess the performance.

During this workshop for the second year, we will report on the results for a 1 day OSSE simulation consistent with the ICON mission. We will discuss these preliminary

results, and refine our plans and simulations for the next year. The last year of the workshop in 2015 will see the final analysis of the simulations, which we hope will be suitable for publication in a peer reviewed journal.

Justification

The primary strategic thrust is development of observational and instrumental strategies for geospace system studies related to the exploration of exchange processes at interfaces and boundaries [CEDAR Strategic Thrust #2 and #4]. The workshop is also relevant to the Heliophysics Decadal survey: “Towards a Diversified, Distribued Sensor Deployment Strategy”. The objective of this workshop is to investigate and improve our understanding of: the internal boundaries between the ionosphere and thermosphere (IT) states, the interaction boundaries between IT, magnetosphere and solar wind, and the boundary interactions between the lower mesosphere and the IT system. A secondary objective is enhanced understanding of internal variability of the ITM system. We note that there is a space weather relevance to society that is also part of the CEDAR broader impacts.

The overall approach to these challenges is to develop a significantly improved global data assimilation capability for estimation of all (or at least several) state variables simultaneously. We will accomplish this by investigating how, and to what degree, different satellite and ground sensor networks and configurations (constellations) can improve the accuracy, spatial resolution and temporal resolution of global estimates of ionosphere-thermosphere (IT) state variables through ingestion into IT data assimilation algorithms and models.

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