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An Analytic Collaborative Framework for the Earth System Observatory

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**Abstract**

NASA's Earth System Observatory groundbreaking observations will provide critical measurements to address societal relevant problems in climate change, natural hazard mitigation, fighting forest fires, and improving real-time agricultural processes. Central to the ESO vision is the notion of Open-Source Science (OSS), a collaborative culture enabled by technology that promotes the open sharing of data, information, and knowledge aiming to facilitate and accelerate scientific understanding, and the agile development of applications for the benefit of society. The larger vision of an Earth System Digital Twin (ESDT) calls for integrated Earth science frameworks that mirror the Earth by a proxy digital construct that includes km-scale resolution Earth system models and data assimilation systems along with an integrated set of analytic tools to enable the next generation of science discoveries and evidence-based decision making.

The goal of this project is to develop an Analytic Collaborative Framework for ESO missions, based on realistic, science-based observing system simulations and the Program of Record (PoR). Tying it all together is a cloud-based cyberinfrastructure that will enable each uniquely designed satellite in the Earth System Observatory to work in tandem to create a 3D, holistic view of Earth. In this presentation, we lay the technological groundwork for enabling such a vision. Our approach consists of the 3 main interconnected building blocks:

1. Cloud-optimized representative datasets for ESO missions and the PoR to serve as basis for developing and prototyping an Analytic Collaborative Framework.

2. An Algorithm Workbench for enabling experimentation and exploration of synergistic algorithms not only for instruments within a mission, but also including the PoR and other ESO missions.

3. A series of concrete Open-Source Science demonstrations including use cases that span science discovery and end-user applications with direct societal impact.

While our ultimate goal is to include all of the main missions comprising the Earth System Observatory, in our initial 2 years we will focus on AOS and SBG, two missions for which specific synergisms have been identified in a recent workshop. In this presentation we will describe our approach and discuss some illustrative examples of our framework.