Portable, Scalable, and Re-usable Science Data Processing Software for NASA Satellite Missions
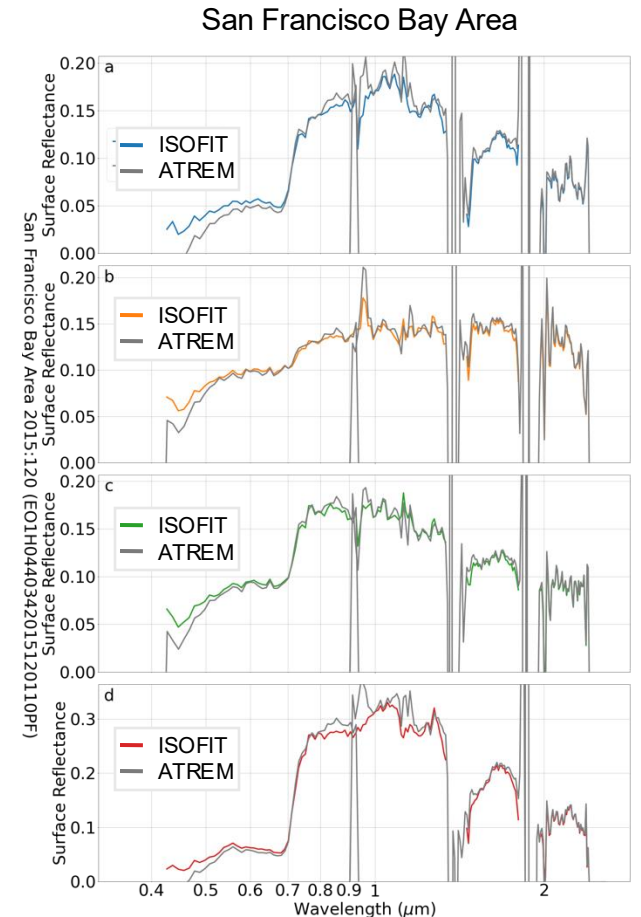
Background

NASA's Earth Observation missions yield large volumes of complex scientific data that require robust data processing systems. Developing software for each mission is expensive and adds significant risk for cost-constrained missions. NASA Earth Exchange (NEX) at Ames has combined the expertise of the Earth Science and Advanced Supercomputing Divisions to create a portable and scalable system, named Ziggy, for science data processing pipelines that can be implemented for any future mission at a fraction of the cost required to develop new software.

Features

Ziggy orchestrates the processing of scientific data, identifies and tracks errors, and records the configuration of the pipeline and algorithms so that the research can be easily repeated or replicated by the scientific community. Ziggy is both flexible and robust, supporting heterogeneous pipelines so that each processing algorithm can be written in any supported language, and each step can run locally on a server or remotely on a supercomputer or cloud computing facility.

Impact

Ziggy is currently in use as the pipeline infrastructure tool for reprocessing the full data volume of the EO-1/Hyperion mission data and is a candidate for use in the upcoming Surface Biology and Geology (SBG) mission of the Earth System Observatory (ESO). In line with NASA's Year of Open Science, Ziggy contains no proprietary or sensitive/controlled software or algorithms and operates as NASA open-source software.

Ziggy was used to compare results using two different atmospheric correction algorithms (ISOFIT and ATREM) in the first full-scale re-processing of the Hyperion EO-1 hyperspectral dataset. The false color composite pairs are the visible and near infrared (VNIR) and short-wave infrared (SWIR) images of the Bay Area (from left to right). The labels (a, b, c, d) on the VNIR and SWIR images indicate the retrieval locations for the surface reflectance in the spectral plots.