

Anomaly Detection and Analysis Framework for Terrestrial Observation and Prediction System (TOPS)

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<u>Objective</u>

Enhance data processing capabilities in Earth sciences by providing a framework for automated anomaly detection, confirmation and on-demand data/model analysis in multivariate scientific observations

- Develop a catalog of model and data hierarchies and their relationships
- Enable multiple on-demand executions of TOPS models with similar datasets
- Develop a searchable catalog of known anomalies
- Provide automatic anomaly confirmation and anomalytriggered workflow execution



Accomplishments

- Developed initial set of ontologies describing data and processes within the TOPS system
- $\boldsymbol{\cdot}$ Integrated several spatial and temporal anomaly detection algorithms into the framework
- Developed a provenance infrastructure supporting the tracking and automatic re-creation of datasets within the system
- Demonstrated the system by automatically re-creating the Amazon drought analysis performed by the NASA Ecocast team for publication in Geophysical Research Letters (GRL) in 2010, reducing the analysis time from two years to three weeks, and extended the analysis to other parts of the world
- Integrated the above analysis with workflow components (VisTrails) so that it can be automatically triggered when similar anomalies are observed
- Performed initial integration of the anomaly framework with the NASA Earth Exchange (NEX)

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$$TRL_{in} = 3$$
 $TRL_{out} = 6$

