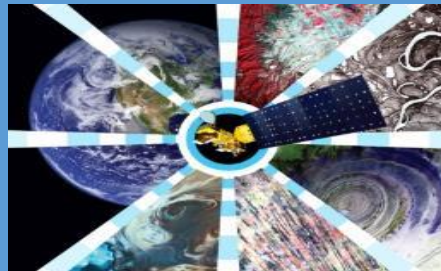
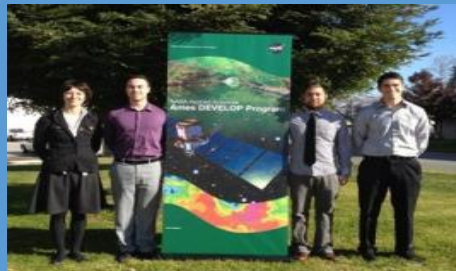


DEVELOP

NATIONAL PROGRAM

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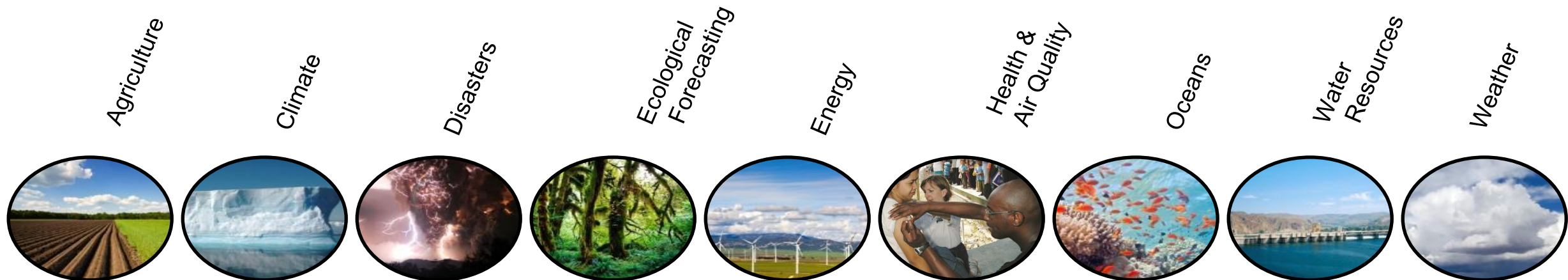


NASA Applied Sciences Program



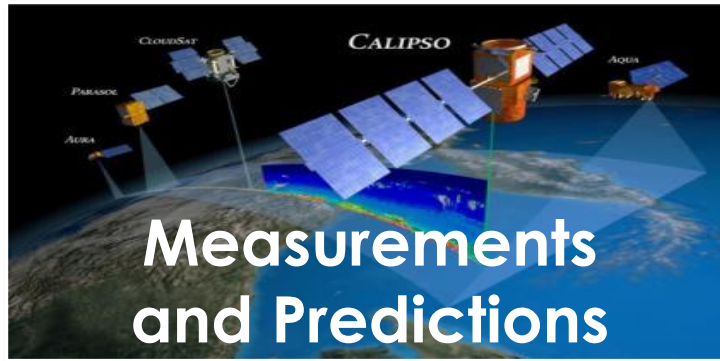
“Discovering Innovative & Practical Applications of NASA Earth Science”

The Applied Sciences Program (ASP) serves as a bridge between the data and knowledge generated by NASA Earth Science and the information and decision-making needs of public and private organizations. The goal of the program is to discover and demonstrate innovative uses and practical benefits of NASA Earth science data, scientific knowledge, and technology.



Applied Sciences Program Website: www.nasa.gov/applied-sciences

What is DEVELOP?

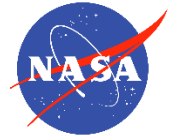


NASA DEVELOP

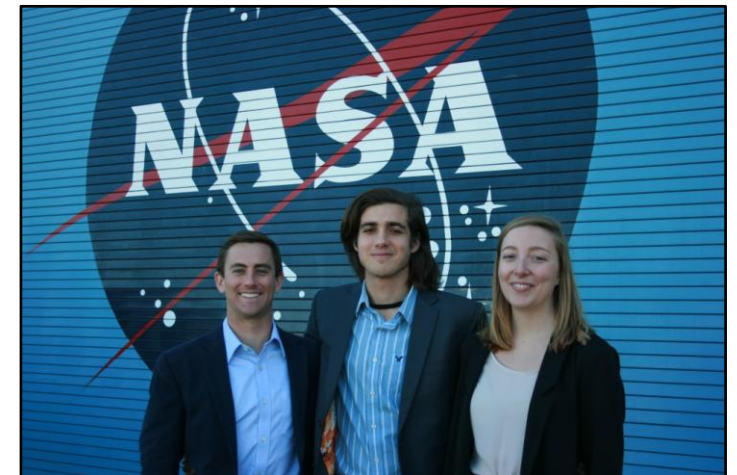


DEVELOP is part of NASA's Applied Sciences Program, **addresses environmental and public policy issues** by conducting **interdisciplinary feasibility** projects that **apply the lens of NASA Earth observations to community concerns** around the globe. Bridging the gap between NASA Earth Science and society, DEVELOP **builds capacity** in both **participants** and **partner organizations** to better prepare them to address the challenges that face our society and future generations. With the competitive nature and growing societal role of science and technology in today's global workplace, DEVELOP is fostering an adept corps of tomorrow's scientists and leaders.

National Aeronautics and
Space Administration



Garrett McGurk (POC)
Mariana Webb
Billy Babis



NASA Ames Research Center
Moffett Field, CA

2017 Spring

CHILE WATER RESOURCES

Integrating NASA Earth Observations into the
Google Earth Engine Platform to Enhance
Drought Monitoring in Chile

Background: Drought in Chile



Pixabay

Sources of Water Resource Stress:

- ▶ Increased human demand and lack of infrastructure to transport water
- ▶ Longer and more extreme dry periods
- ▶ Rising 0 degree C isotherm

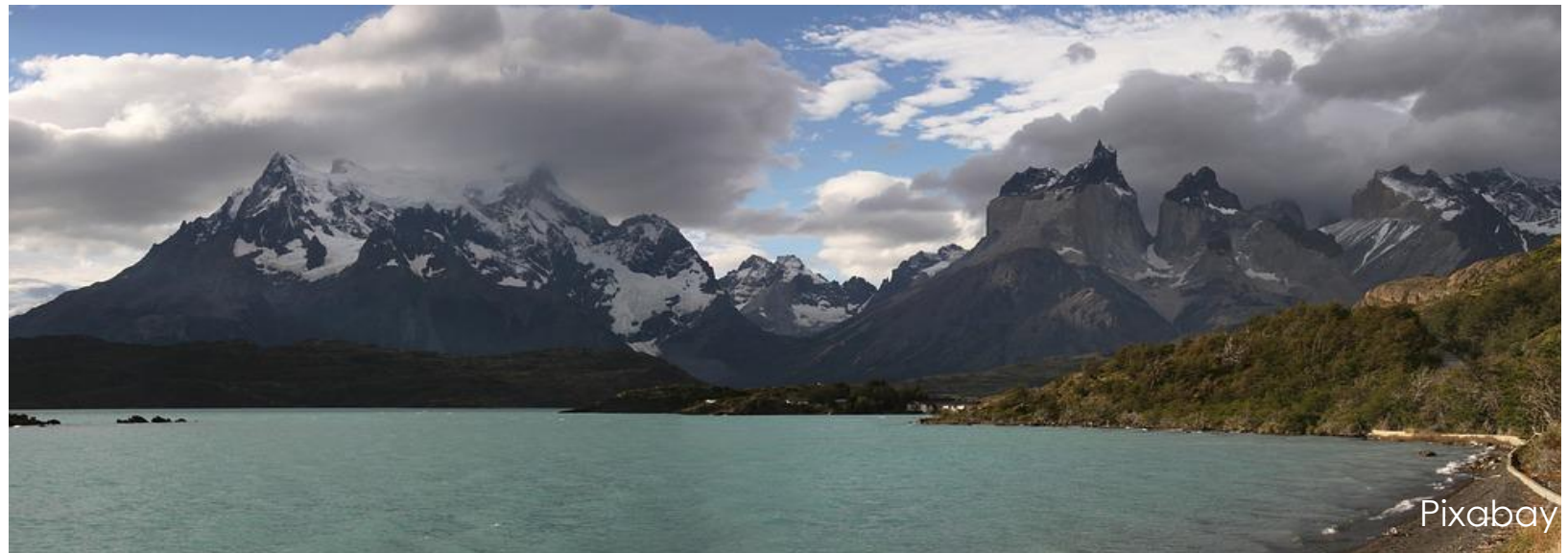
Current Drought Monitoring Tools:

- ▶ Agroclimate Observatory in Chile Climate Data Library
- ▶ UNESCO Latin America Flood and Drought Monitor tool

Introduction: Project Goals



“Incorporate NASA Earth observation derived soil moisture, snow cover, and snow water equivalent data into Chile’s drought monitoring and decision making processes using the Google Earth Engine Platform”





Introduction: Project Parameters

Study Area

- ▶ Chile

Study Period

- ▶ 2001 to present

Project Partners

- ▶ Chile Ministry of Agriculture
- ▶ Agricultural Office of the Chilean Embassy to the United States





NASA Earth Observations Used

Snow Cover

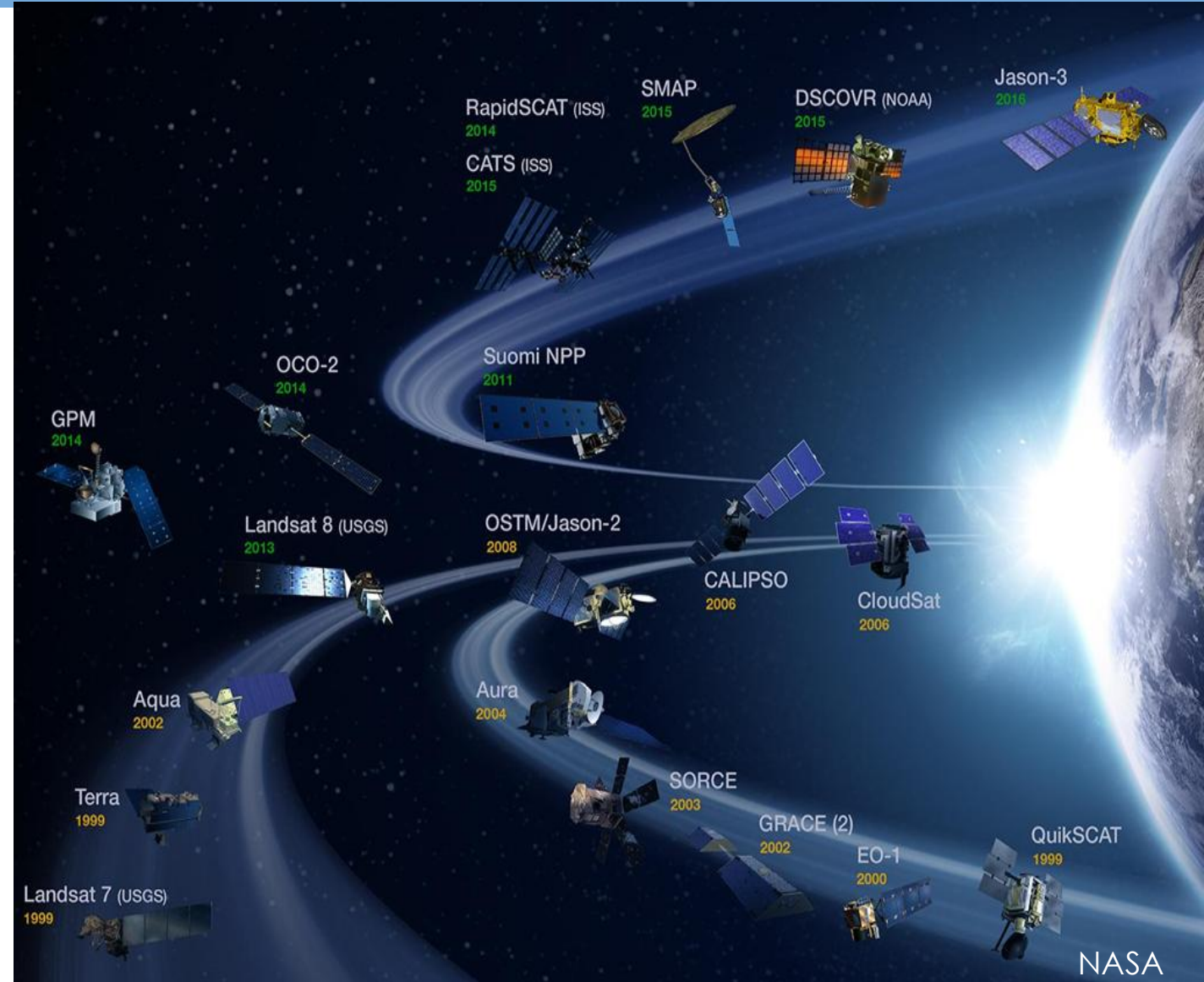
- ▶ TERRA MODIS daily (2001-present)

Snow Water Equivalent

- ▶ Aqua AMSR-E (2001-2011)
- ▶ JAXA GCOM-W1 AMSR2 (2012-present)

Soil Moisture

- ▶ SMAP Radiometer (2015-present)





Methodology

Ingest Imagery

Upload NASA datasets into a shared GEE Repository

Visualize Data

Use GEE Code Editor to compute and display data

Monitor Drought

Analyze hydrologic data

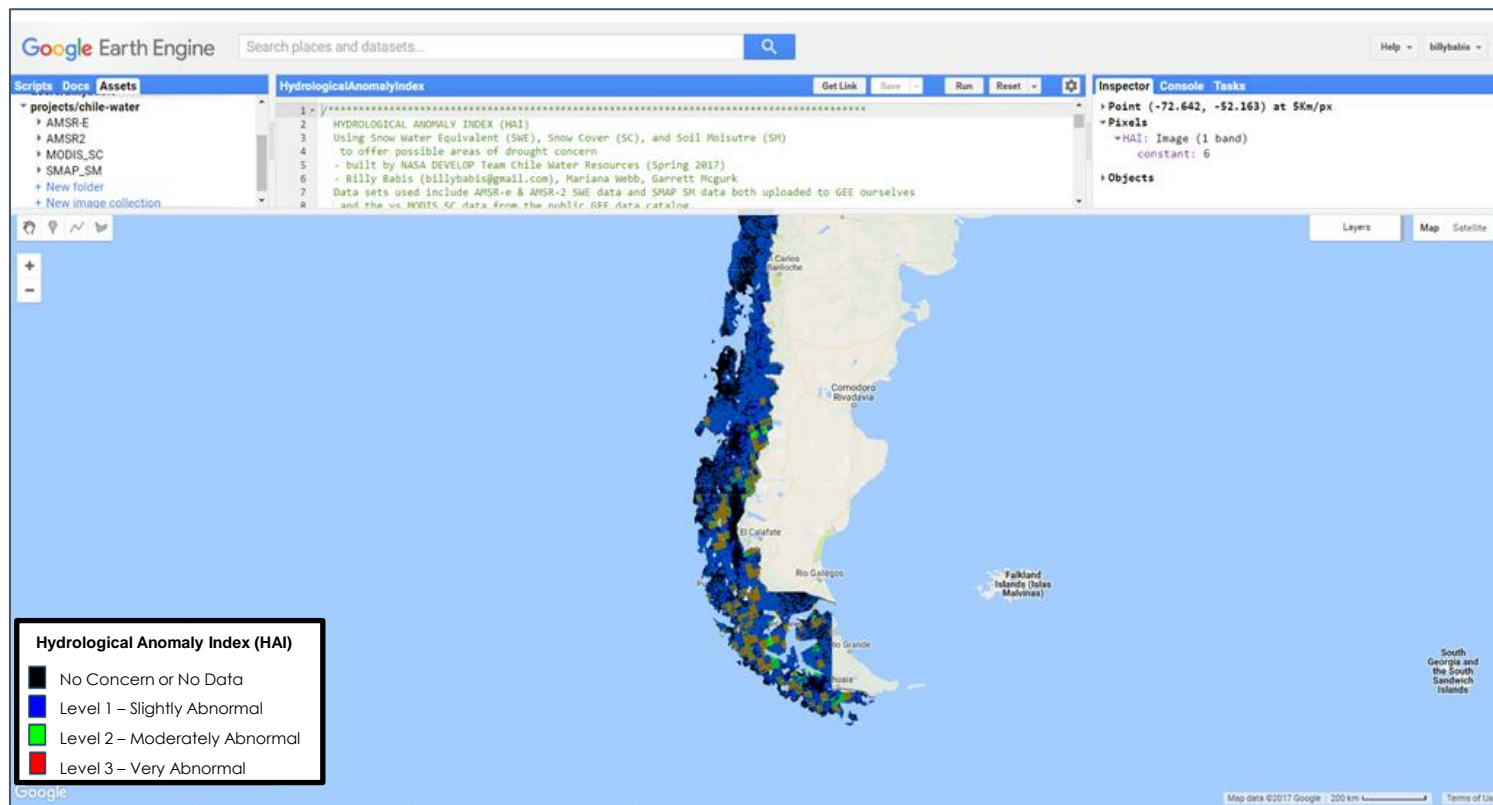
Google Cloud Storage

DAAC



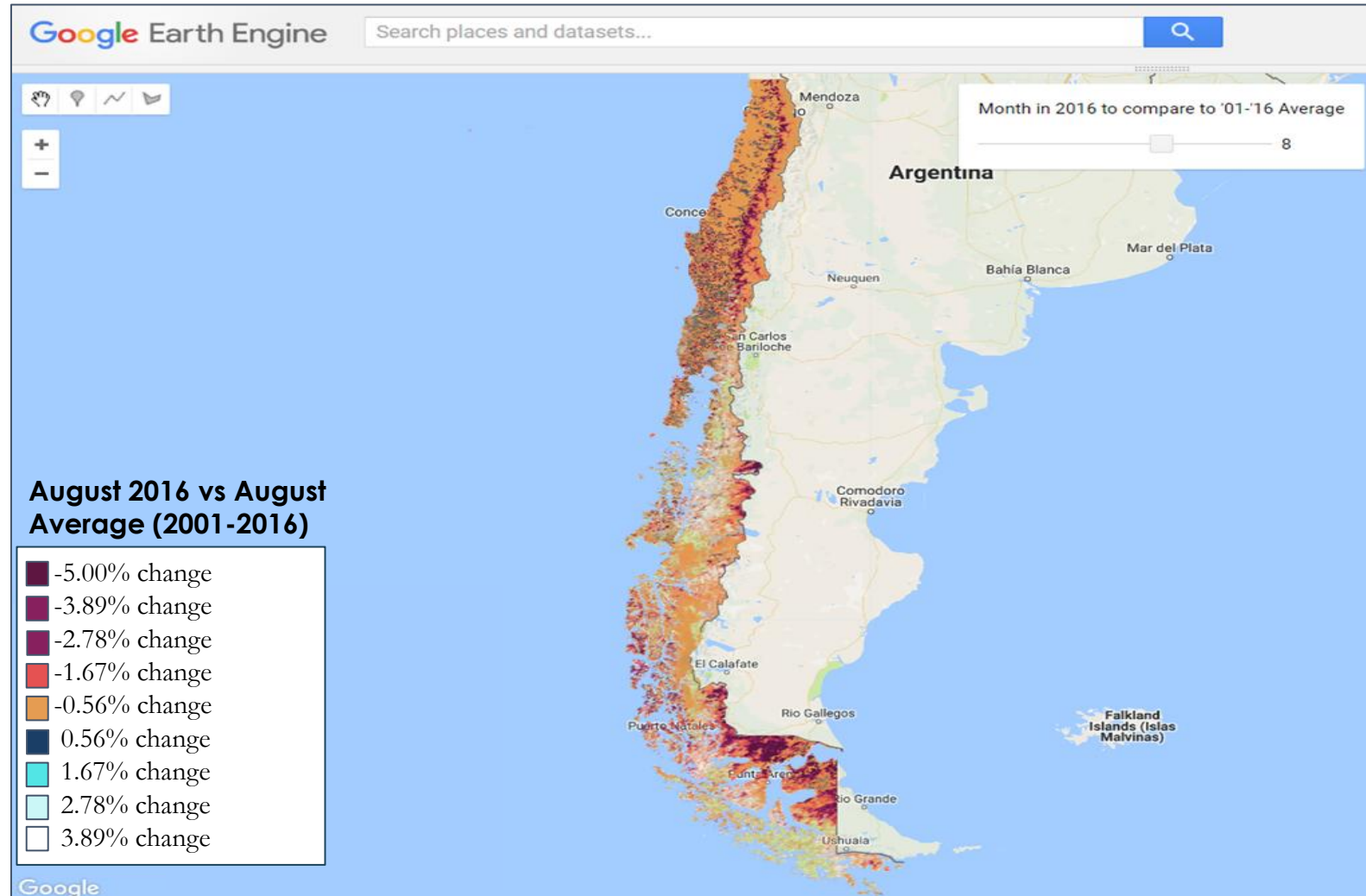
Results

- ▶ Hydrological Anomaly Engine (HAE)
 - ▶ Shared dataset asset repository
 - ▶ [Shared GEE script repository](#)
 - ▶ Hydrological Anomaly Index (HAI)
 - ▶ Data Ingestion Tutorial





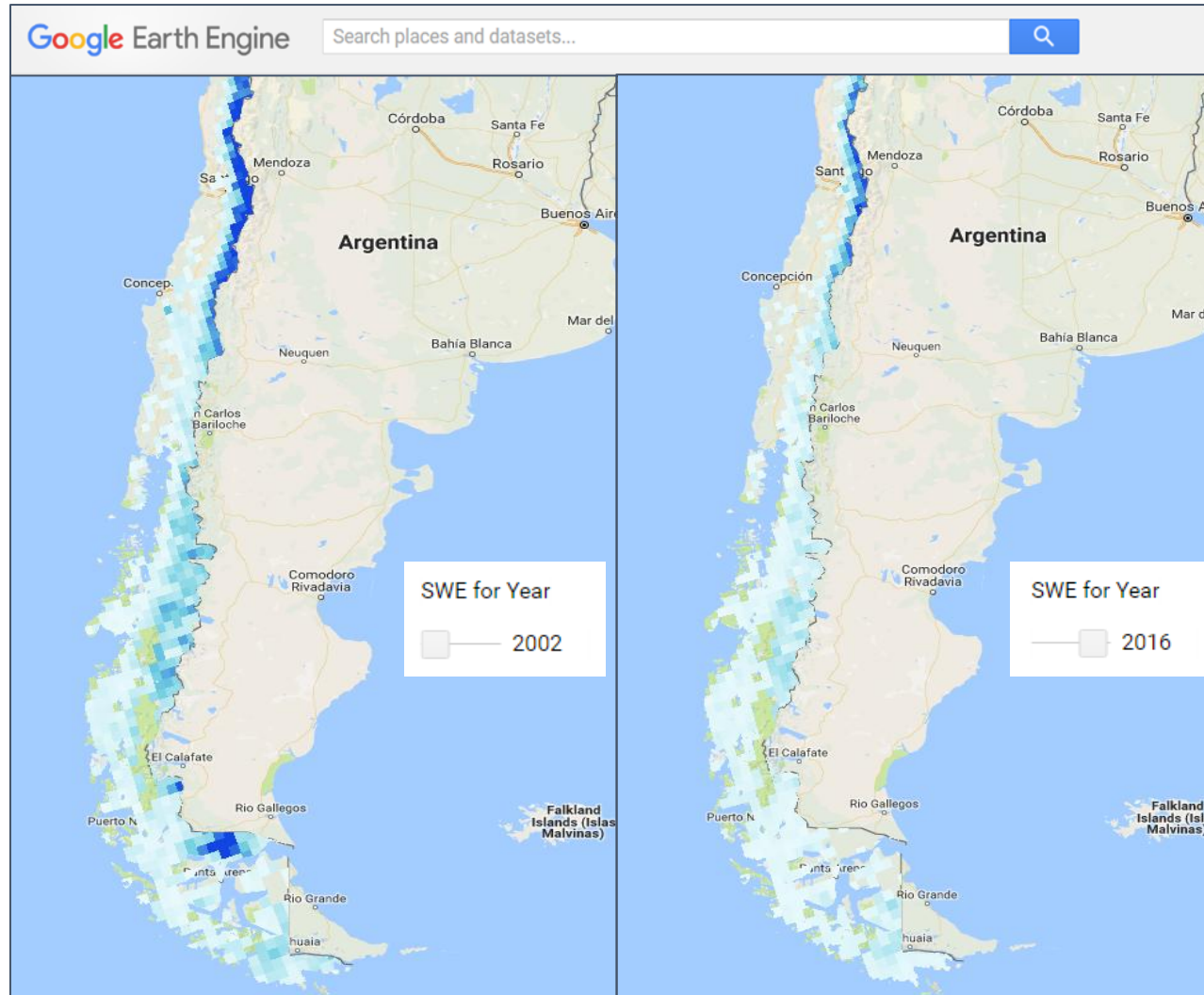
Sample Visualization: MODIS Snow Cover



Snow Cover Percent Change - August 2016 vs August average (2001-2016)



Sample Visualization: Snow Water Equivalent



2002

2016

Snow Water Equivalent

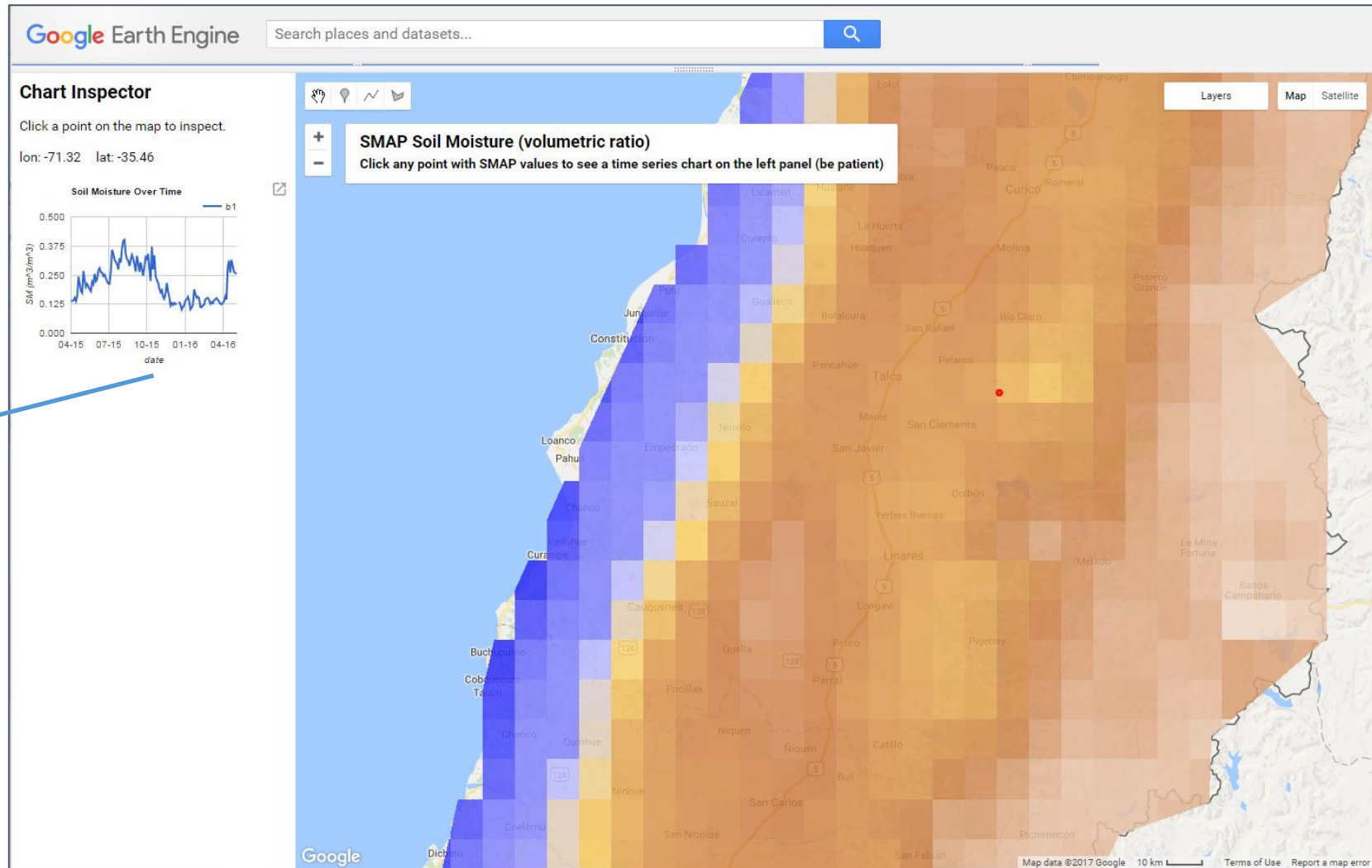
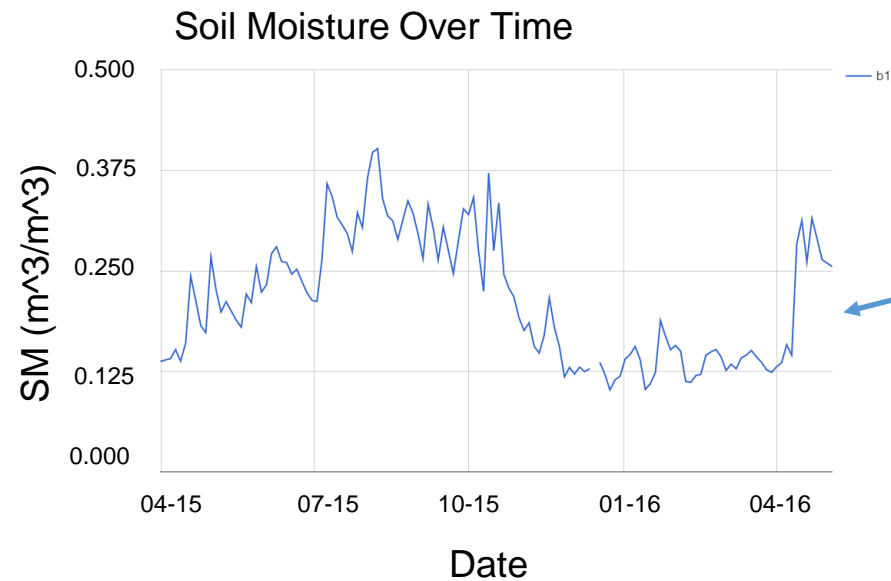
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Sample Visualization: Soil Moisture



SMAP Soil Moisture with Soil Moisture Over Time Graph

Discussion

Advantages

- ▶ Consolidated, efficient, customizable
- ▶ No monetary fees for users

Challenges

- ▶ Uploading batch data with metadata
- ▶ Downloading GeoTiff's with projection

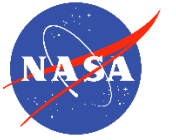




Future Work

Chile Water Resources Part II

- ▶ Validation of Google Earth Engine API decision support tool
- ▶ Quantify Glacier mass in Aconcagua region



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