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**Motivation:** Understanding the impacts of climate change on natural and human systems poses major challenges as it requires the integration of models and data across various disciplines, including hydrology, agriculture, ecosystem modeling, and econometrics.

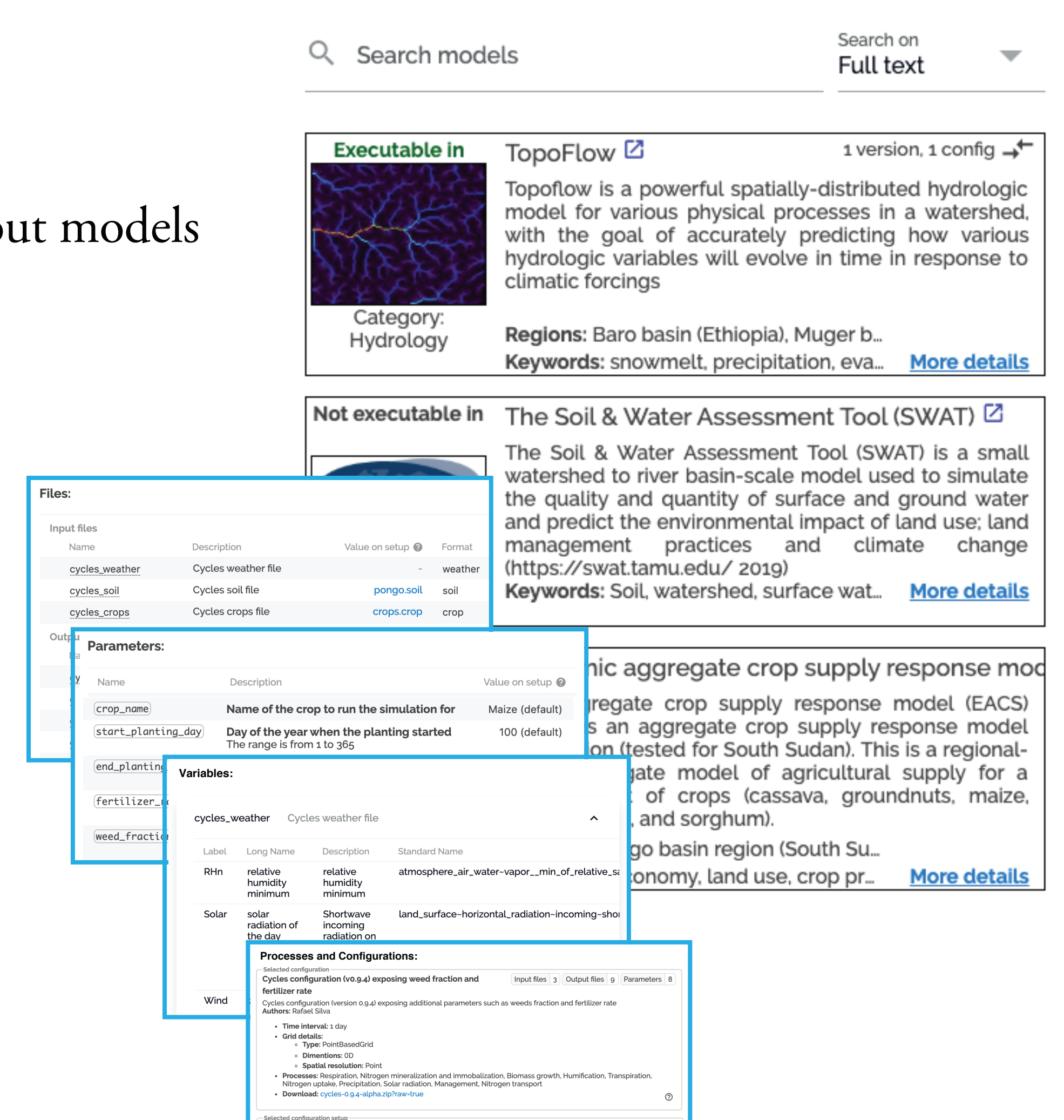
**Proposed approach:** The Model INTeGration (MINT) framework utilizes semantic representation to describe datasets and models to support modelers in data search and transformations, model selection and set up, ultimately combining them into scientific workflows for execution and visualization of the results. MINT is designed both for modelers and analysts, who ultimately propose a range of solutions to the decision makers.

## 1 Identify and prepare relevant models

### Model Catalog

Representing knowledge about models

1. Data formats
2. Model variables
3. Constraints
4. Adjustable parameters
5. Interventions
6. Execution of ensembles
7. Data preparation
8. Post-processing
9. Calibration
10. Sensitivity analysis



**Cycles configuration (v0.9.4) exposing weed fraction and fertilizer rate**

Model configurations are customizations of the model that use a subset of all the processes and functions that are possible with the general model software. Model set ups are manual configurations of a model for a specific geographical area or region, where some of the input data or parameters are constrained or fixed.

You can create a new model set up or do further customization of an existing one by editing the parameters to constrain their values further or to set defaults, fix input data files by providing a URL to them, and edit the descriptions of the model configuration to reflect the changes.

**Description:** Cycles configuration (version 0.9.4) exposing additional parameters such as weeds fraction and fertilizer rate

**Keywords:** agriculture, cycles, crop growth, weather, soil, crop management

**Configuration creator:** Rafael Silva

**Software image:** mintproject/cycles:0.9.4-alpha

**Component Location:** <https://github.com/mintproject/MINT-WorkflowDomain/blob/18cf9d2b17fad244e6e1a439b76f241486/WINGSWorkflowComponents/cycles-0.9.4-alpha/cycles-0.9.4-alpha.zip?raw=true>

**Location:** Grid from the Cycles agriculture model

**Grid:** PointBasedGrid  
Spatial resolution: Point Dimensions: 0D Shape: Point

**Time interval:** Simple cycles time interval

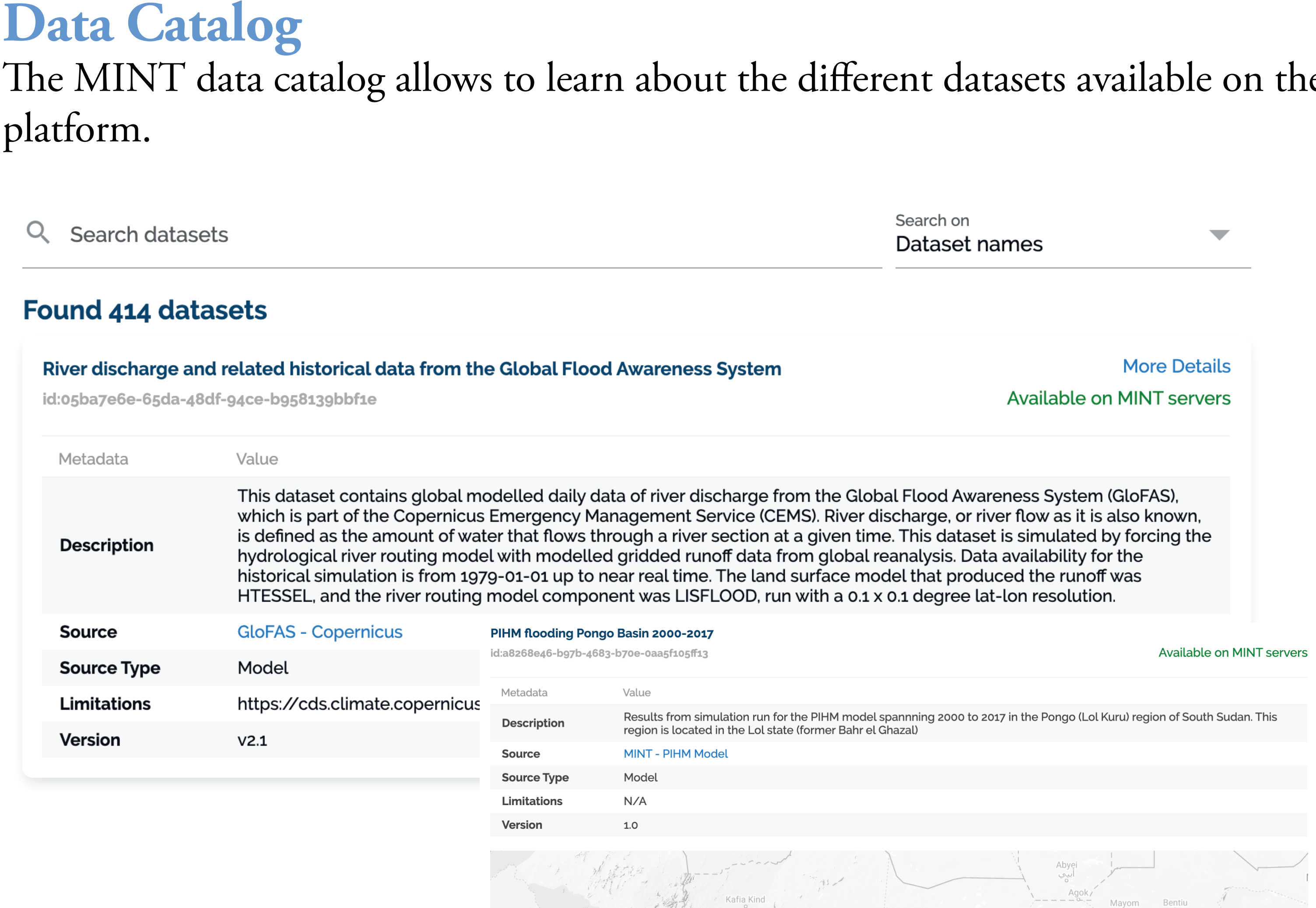
**Processes:** Nitrogen uptake, Precipitation, Solar radiation, Transpiration, Management, Humification, Nitrogen mineralization and immobilization, Biomass growth, Nitrogen transport, Respiration

**Parameters:** (Table with columns: Label, Type, Default Value, Unit)

## 2 Browse and prepare datasets

### Data Catalog

The MINT data catalog allows to learn about the different datasets available on the platform.



**Found 414 datasets**

**River discharge and related historical data from the Global Flood Awareness System**  
id:05ba7e6e-65da-48df-94ce-b958139bfb1e Available on MINT servers

**Description:** This dataset contains global modelled daily data of river discharge from the Global Flood Awareness System (GloFAS), which is part of the Copernicus Emergency Management Service (CEMS). River discharge, or river flow as it is also known, is defined as the amount of water that flows through a river section at a given time. This dataset is simulated by forcing the hydrological river routing model with modelled gridded runoff data from global reanalysis. Data availability for the historical simulation is from 1979-01-01 up to near real time. The land surface model that produced the runoff was HTESSEL, and the river routing model component was LISFLOOD, run with a 0.1 x 0.1 degree lat-lon resolution.

**Source:** GloFAS - Copernicus

**Source Type:** Model

**Limitations:** <https://cds.climate.copernicus>

**Version:** v2.1

**PIHM flooding Pongo Basin 2000-2017**  
id:a828e48-b97b-4883-b70e-0aa51018f13 Available on MINT servers

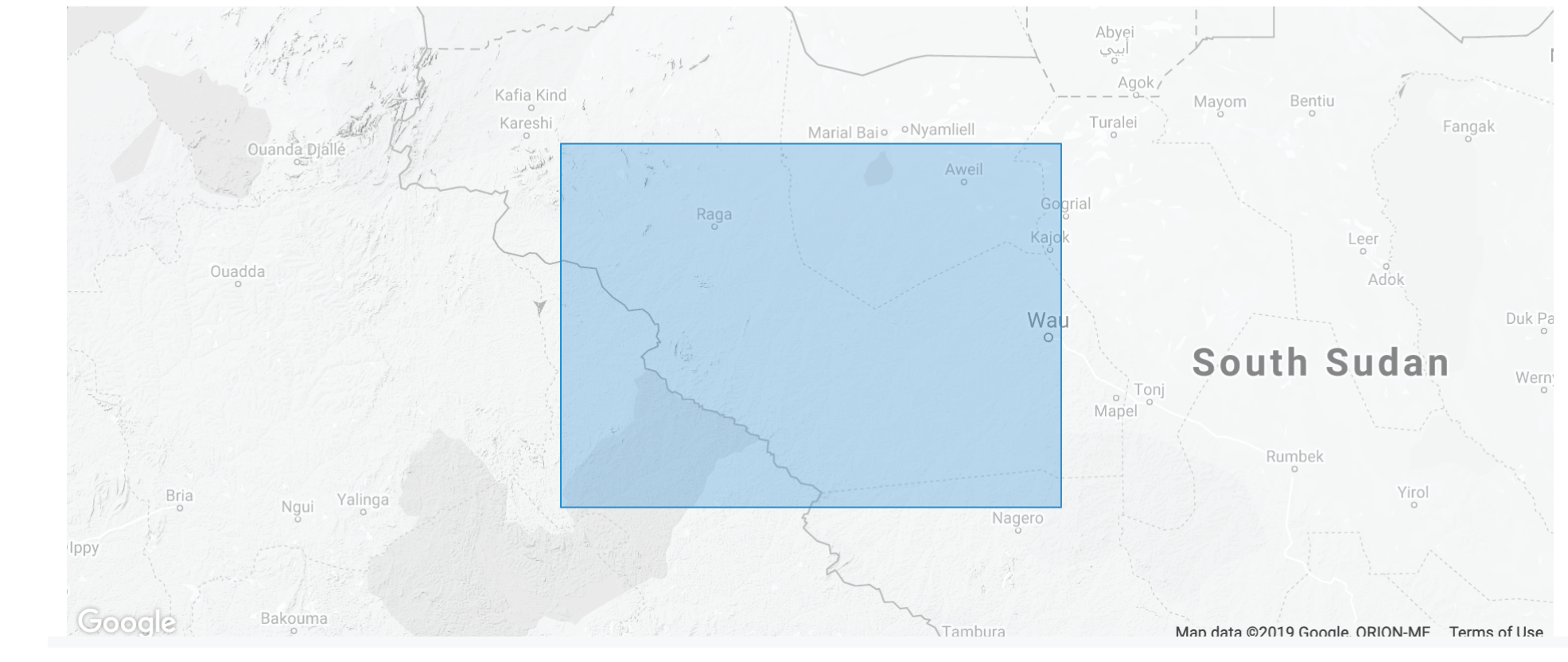
**Description:** Results from simulation run for the PIHM model spanning 2000 to 2017 in the Pongo (Lul Kurul) region of South Sudan. This region is located in the Loti state (former Bahr el Ghazal)

**Source:** MINT - PIHM Model

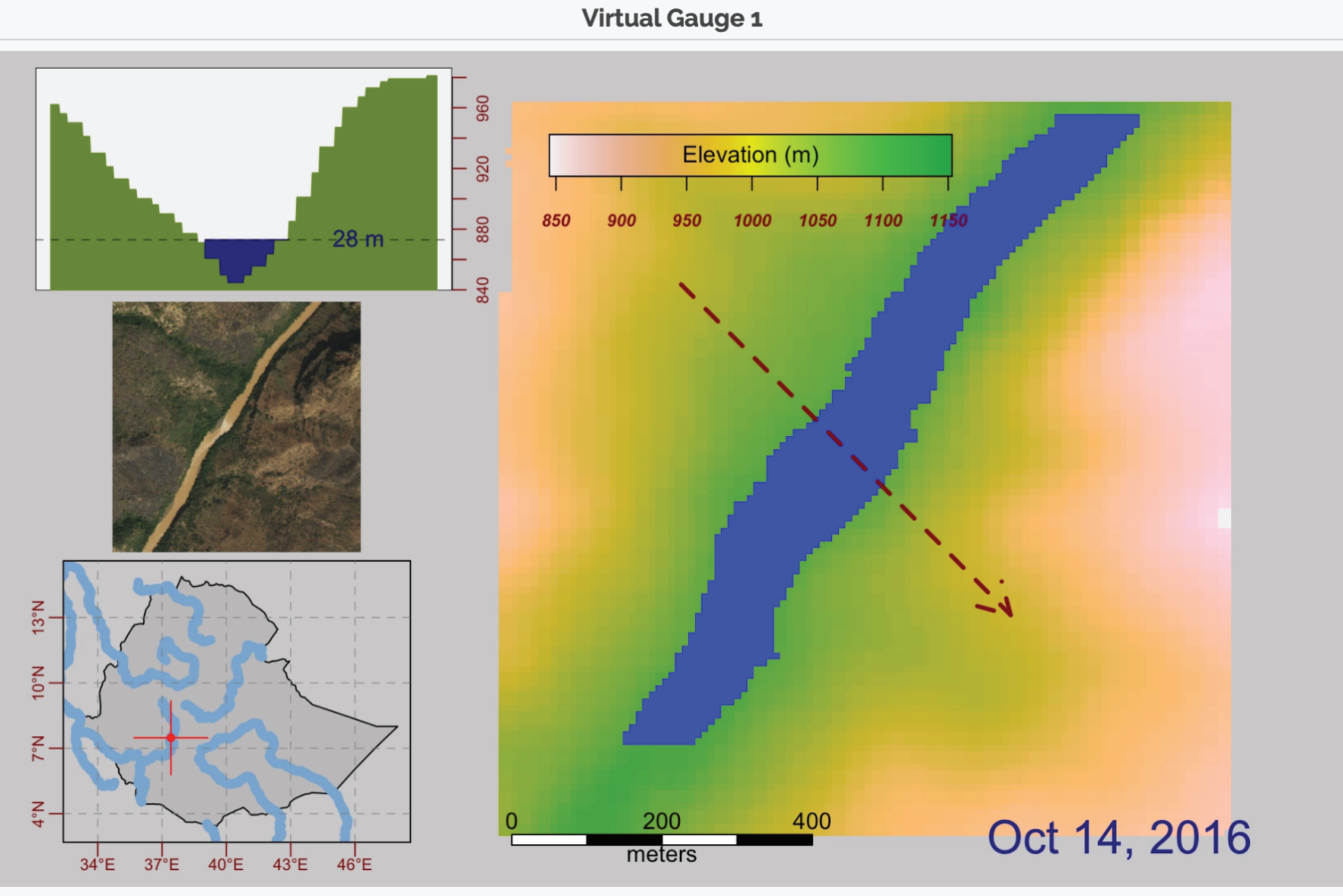
**Source Type:** Model

**Limitations:** N/A

**Version:** 1.0



**Virtual Gauge 1**

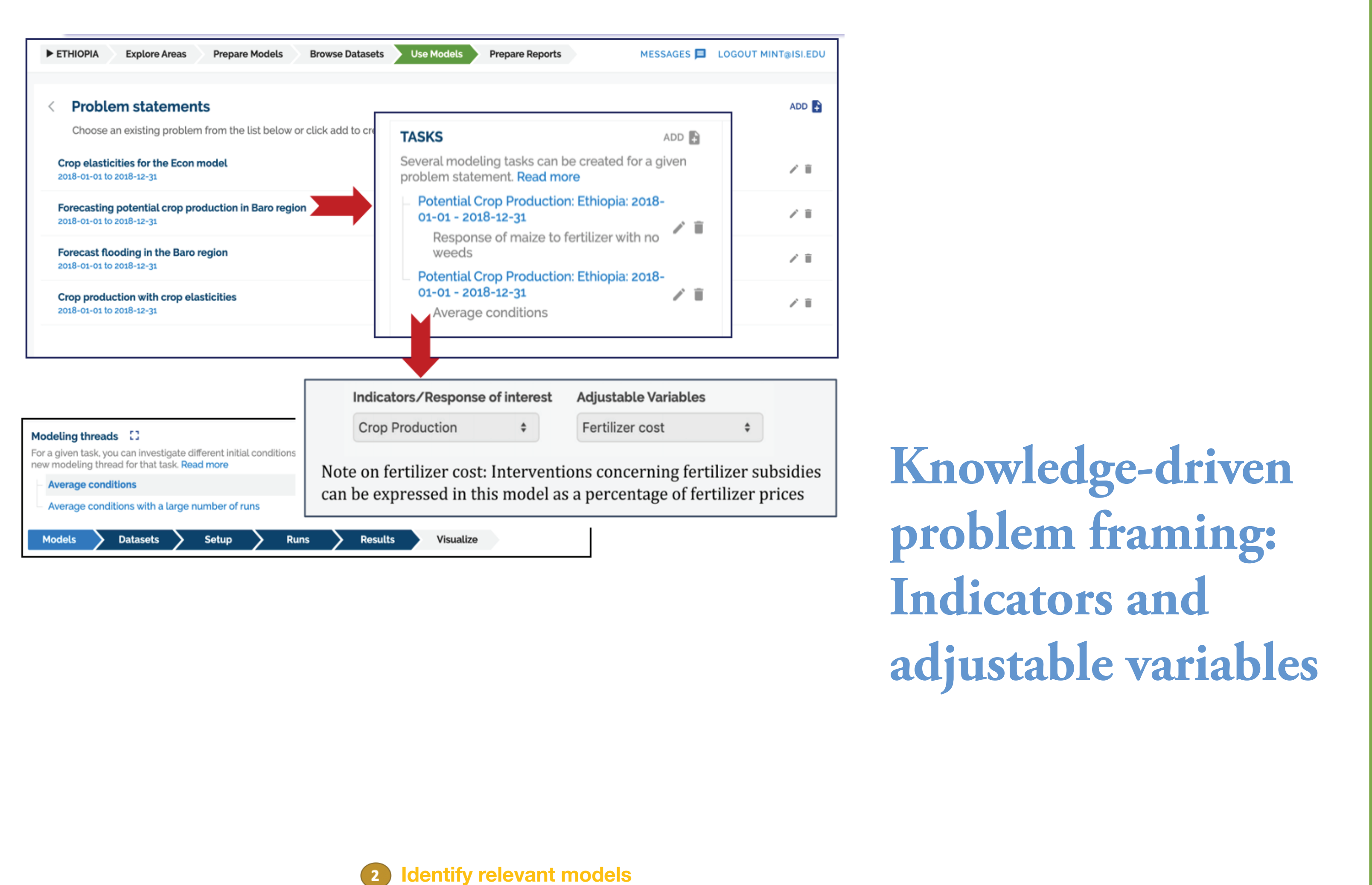


Oct 14, 2016

### Theory-Guided Data Science

We use physics-guided neural networks (Karpatne et al, 2017) to generate physically consistent models of river width and depth.

## 3 Run models



**Problem statements**

Choose an existing problem from the list below or click add to create a new one.

- Crop elasticities for the Econ model
- Forecasting potential crop production in Baro region
- Forecast flooding in the Baro region
- Crop production with crop elasticities

**TASKS**

Several modeling tasks can be created for a given problem statement. Read more

- Potential Crop Production: Ethiopia: 2018-01-01 - 2018-12-31
- Response of maize to fertilizer with no weeds
- Potential Crop Production: Ethiopia: 2018-01-01 - 2018-12-31
- Average conditions

**Indicators/Response of Interest:** Crop Production

**Adjustable Variables:** Fertilizer cost

Note on fertilizer cost: Interventions concerning fertilizer subsidies can be expressed in this model as a percentage of fertilizer prices

**1 Identify variables of interest**

**2 Identify relevant models**

**3 Compare models**

**4 Setup and run model**

**5 Adjust model to explore interventions, identify problem areas**

**6 Prepare modeling products for analyst**

- Subsidies for sorghum fertilizer will decrease sesame production
- If sorghum prices fall, sesame and maize production increase
- If sesame prices fall, groundnuts production will increase

**MINT User Interactions**

<http://mint-project.info>