Protocol for the Analysis of Land Surface models (PALS) and modelevaluation.org

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PALS

Protocol for the Analysis of Land Surface models

Welcome to PALS

The Protocol for the Analysis of Land Surface models is a web application for evaluating and benchmarking land surface models. It provides standards for model input/output formatting, driving data for modelling experiments, as well as a wide range of automated diagnostic performance measures once model output is uploaded. More about PALS features.

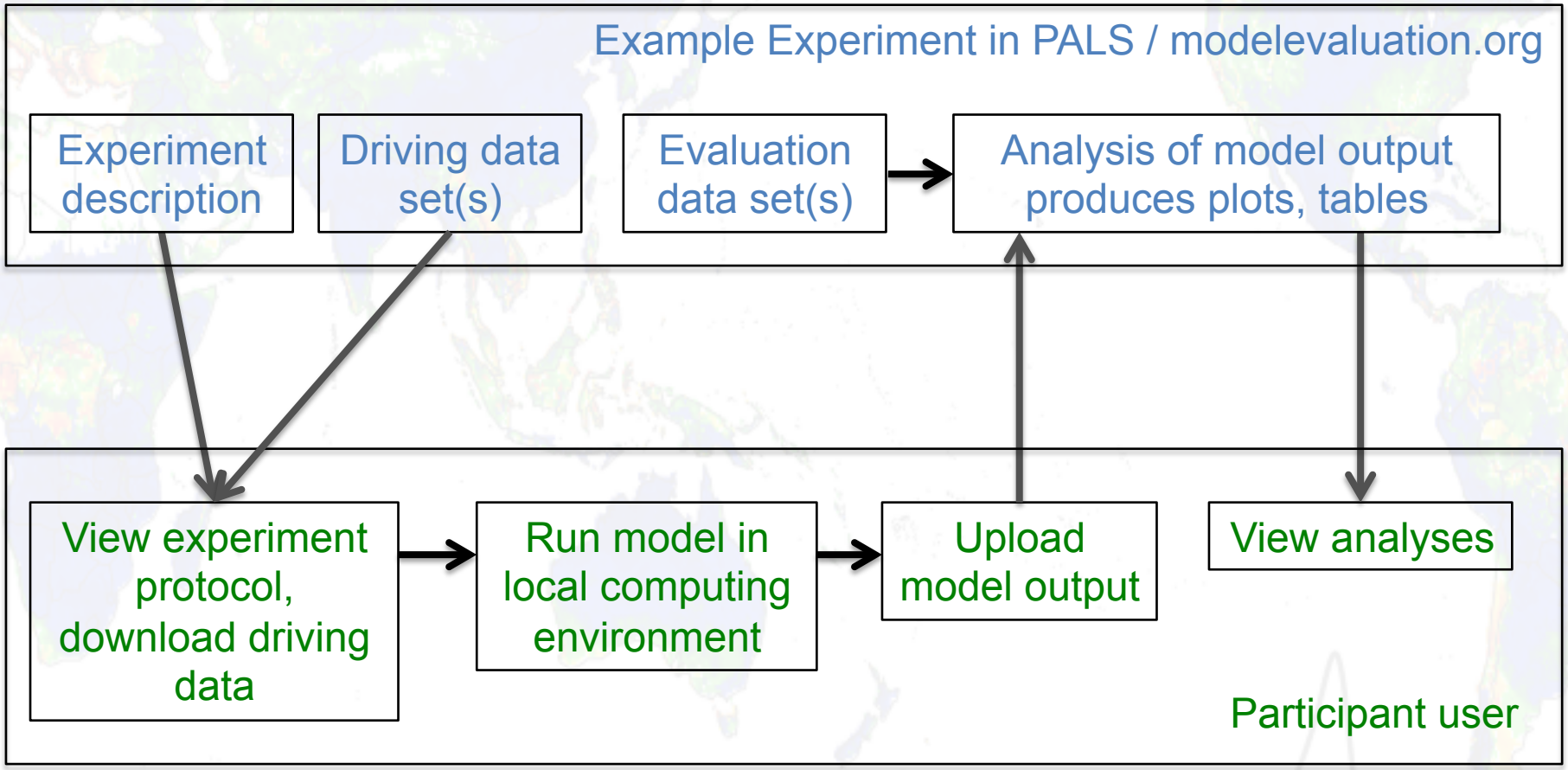
PALS is supported by a range of funding and research coordination bodies, including the Terrestrial Ecosystem Research Network (TERN), the ARC Centre of Excellence for Climate System Science, the GEWEX Global Land Atmosphere System Study panel, the Australian Energy and Water Exchange initiative. **More about PALS collaborators.**

PALS is collaboratively developed and maintained by many researchers. While we endeavour to maintain PALS at the highest standards, authors and contributors take no responsibility whatsoever for damages of any kind resulting from the use of the PALS site.

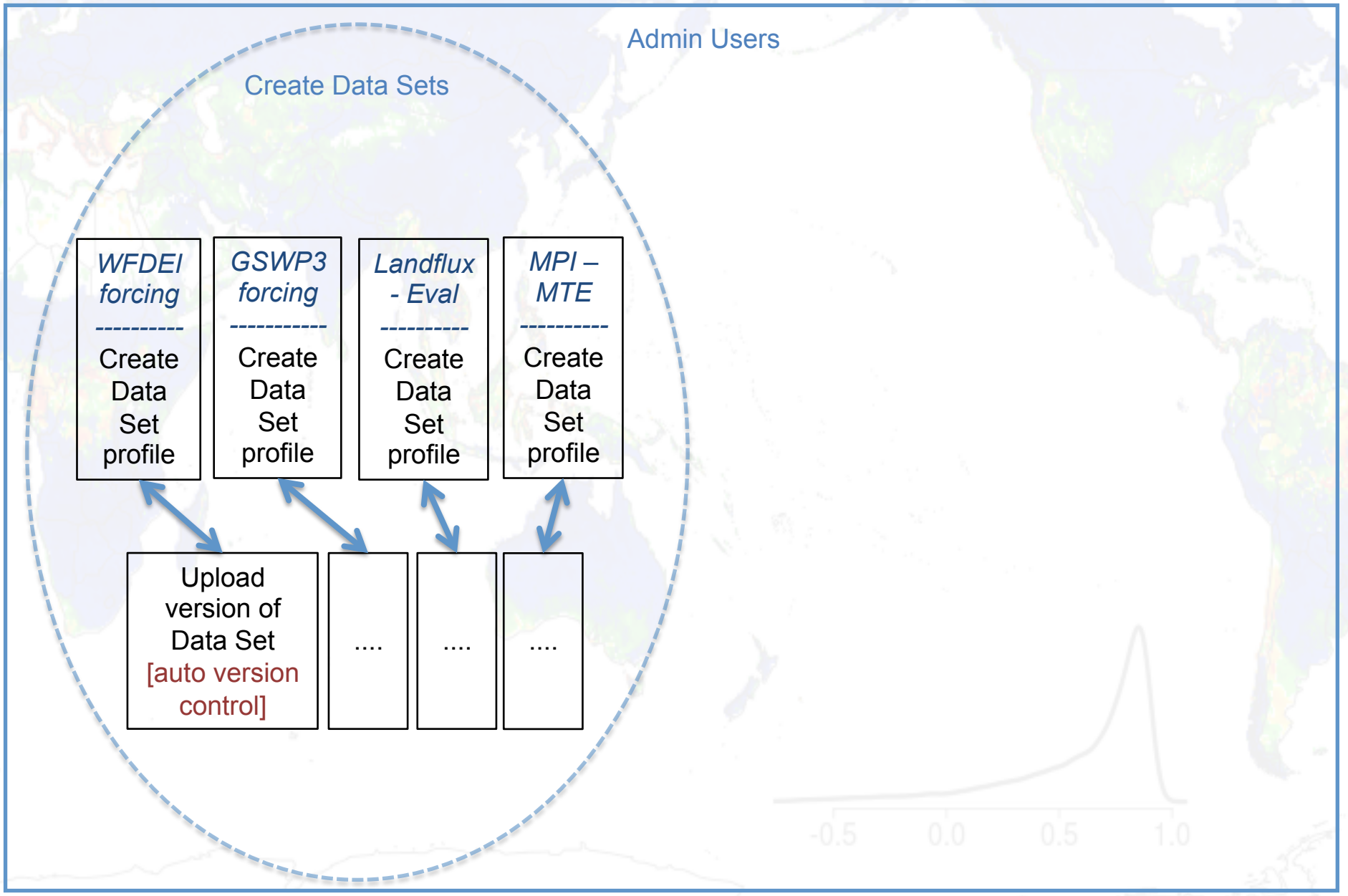
PALS terms and conditions

All of the software behind PALS is open source. Contact palshelp@gmail.com for more information.

Participating in an Experiment - simple description



Creation of Data Sets and Experiments



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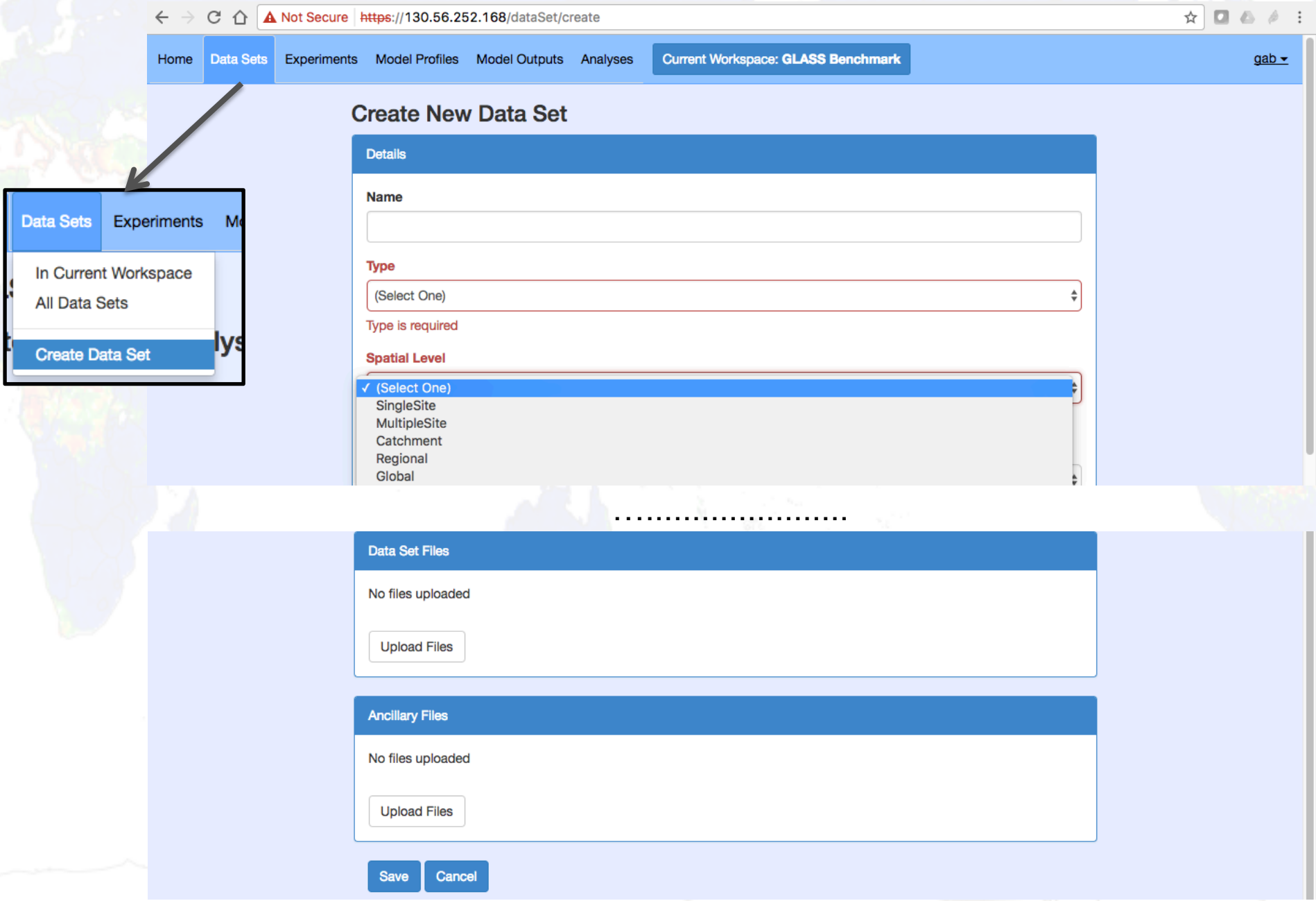

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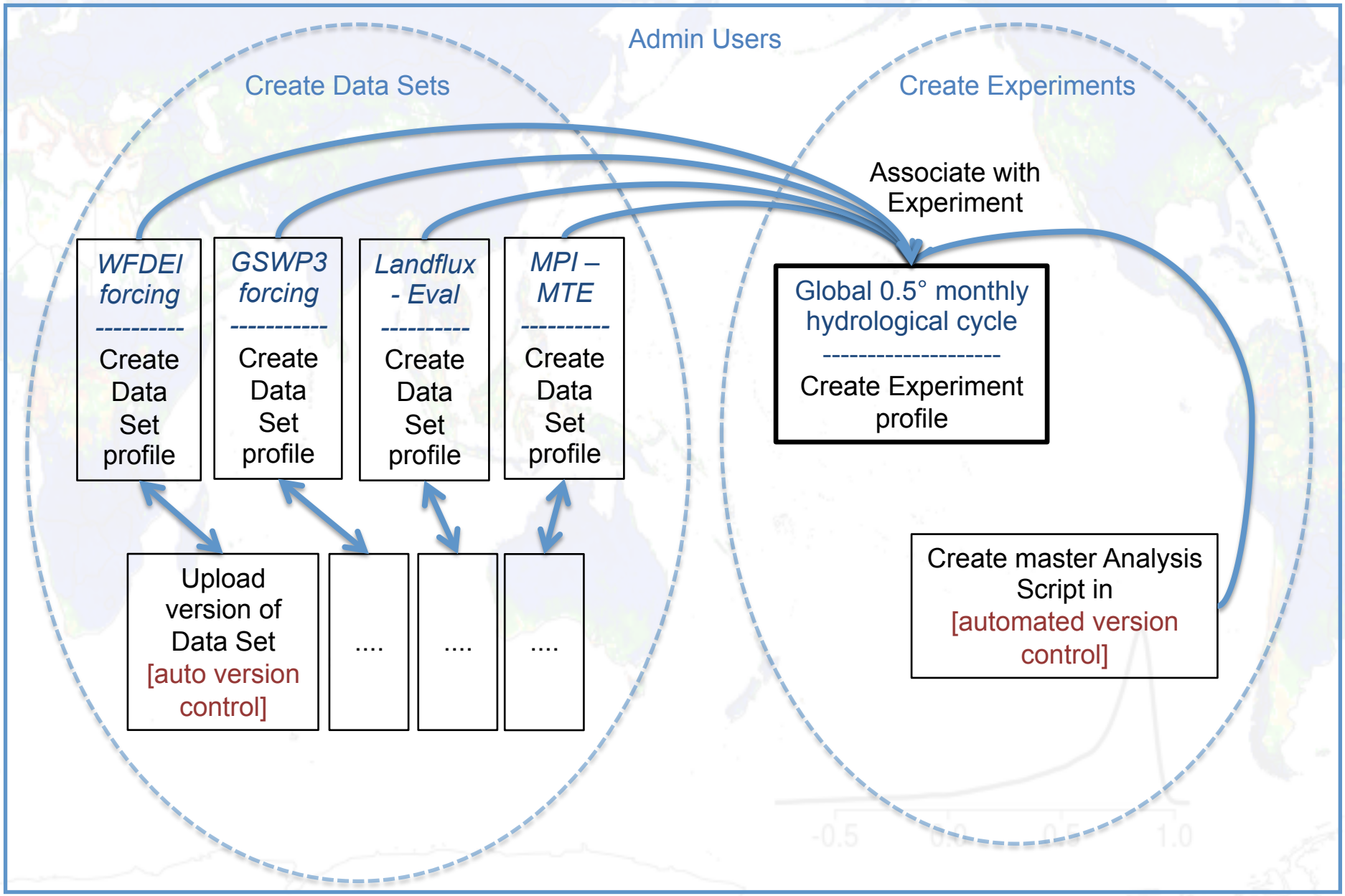

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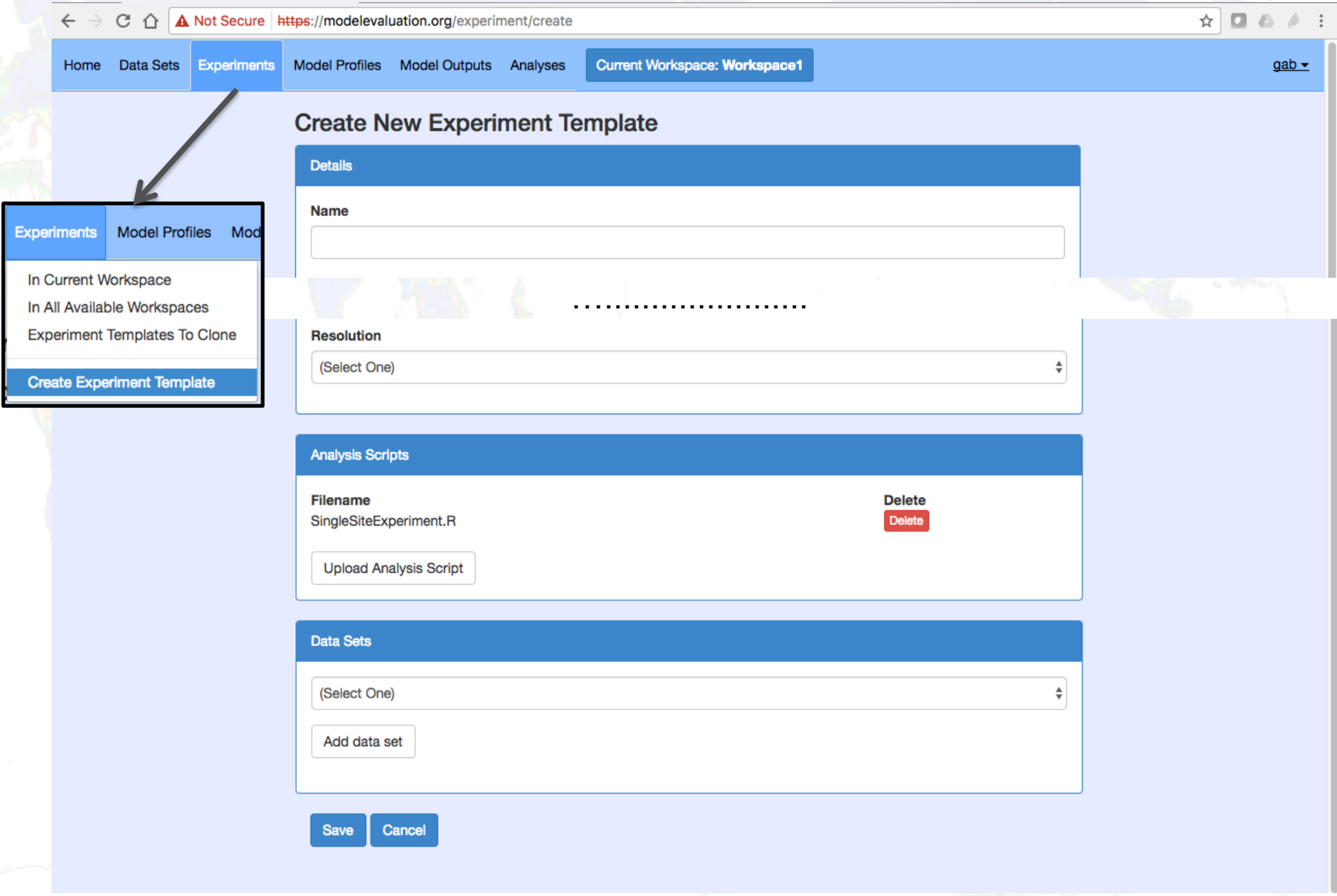

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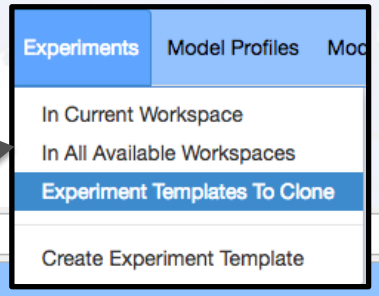

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Home | Data Sets | Experiments | Model Profiles | Model Outputs | Analyses | Current Workspace: **Workspace1** | gab

Experiment Templates For Cloning Into Current Workspace

○ All ◉ SingleSite ○ MultipleSite ○ Catchment ○ Regional ○ Global

Filter

Name ▲	Vegetation Type	Country	Years	Owner	Clone	Delete
AmpleroFluxnet	Grassland	Italy		Gab Abramowitz	Cloned	Delete
AudubonFluxnet	Grassland	United States		Gab Abramowitz	Clone	Delete
BlodgettFluxnet	Evergreen needleleaf	United States		Gab Abramowitz	Clone	Delete
BondvFluxnet	Cropland	United States		Gab Abramowitz	Clone	Delete
BoreasFluxnet	Evergreen needleleaf	Canada		Gab Abramowitz	Clone	Delete
BrookingFluxnet	Grassland	United States		Gab Abramowitz	Clone	Delete
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CabauwFluxnet	Grassland	Netherlands		Gab Abramowitz	Clone	Delete
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DegeroFluxnet	Permanent wetland	Sweden		Gab Abramowitz	Clone	Delete

Show 10 rows per page

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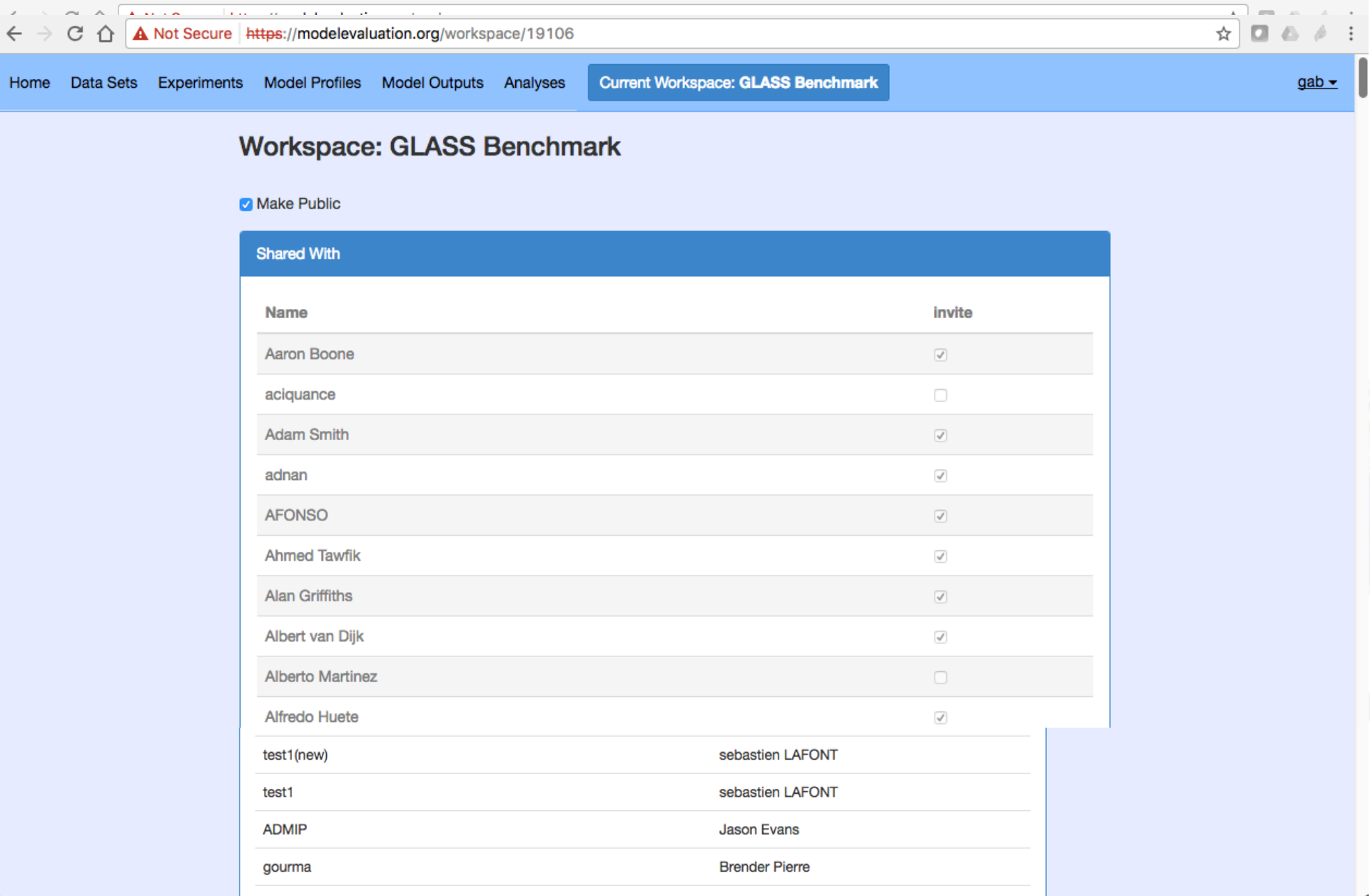
Using Experiments – MIP or development environment

Global 0.5° hydrological cycle Experiment	PLUMBER Experiment	Global 0.5° greenness, VOD Experiment	....	Existing Experiment templates created by Admin users

Using Experiments – MIP or development environment: Workspaces



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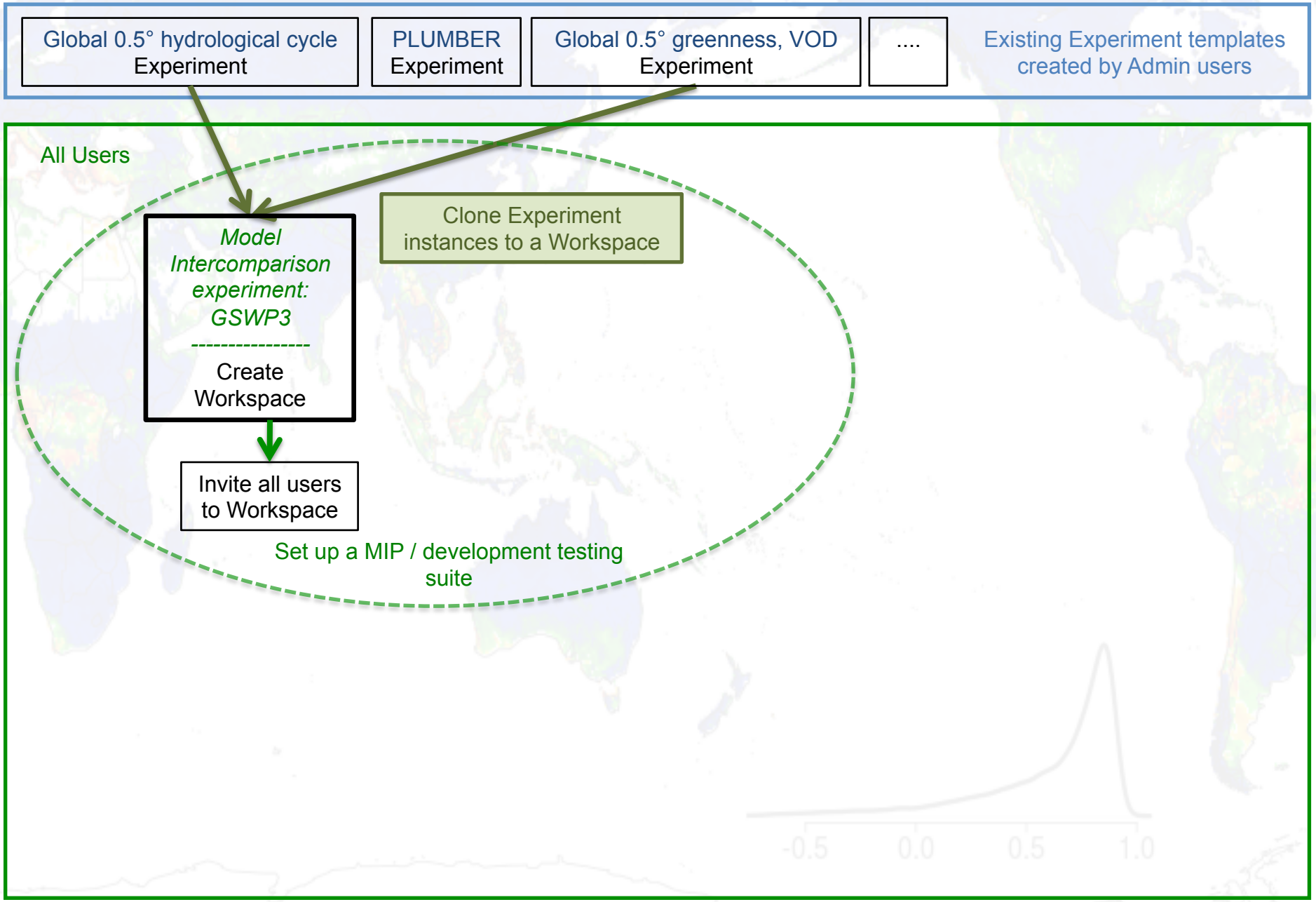

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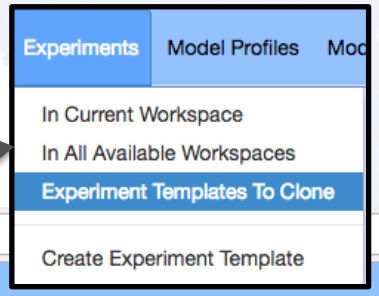

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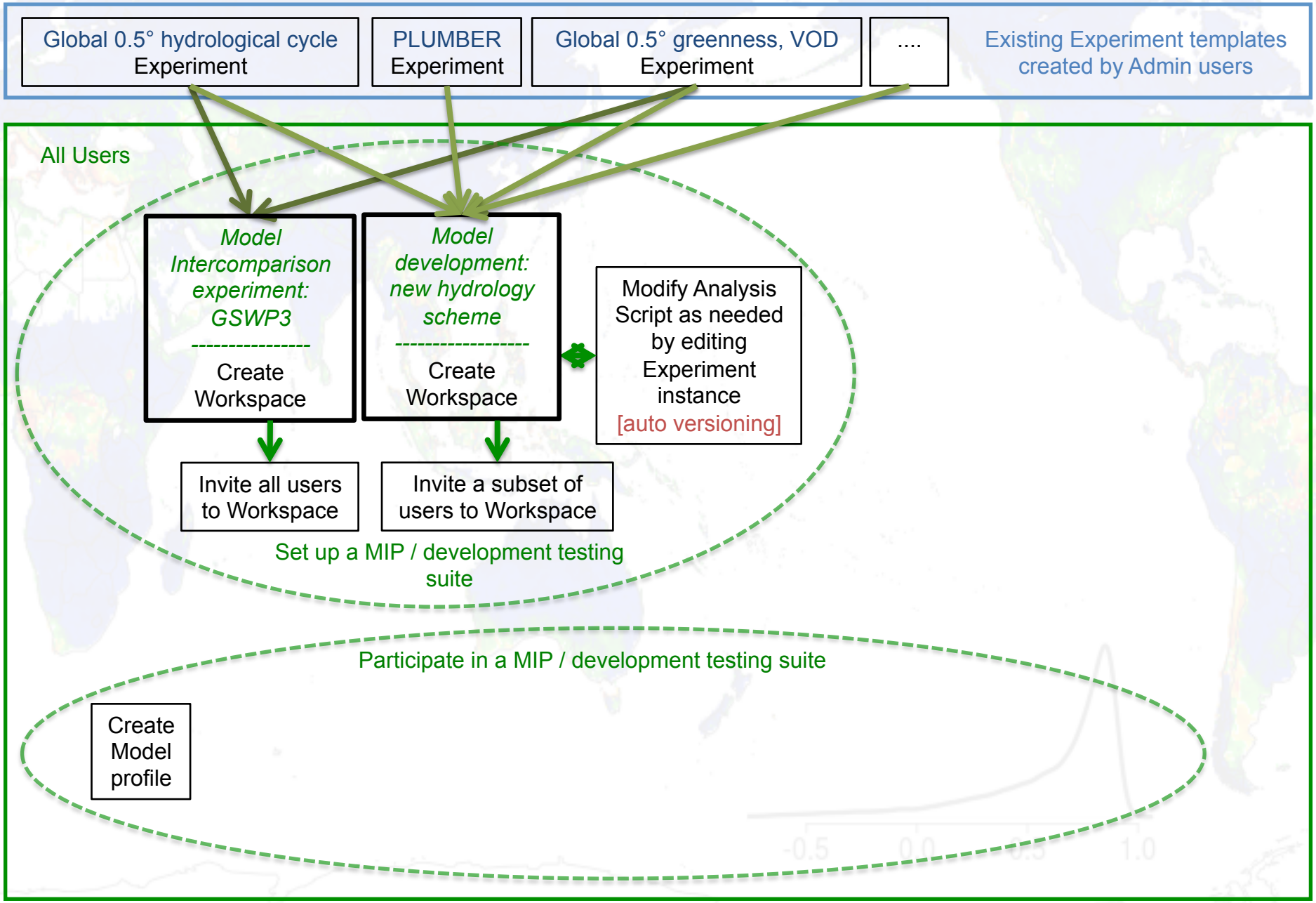
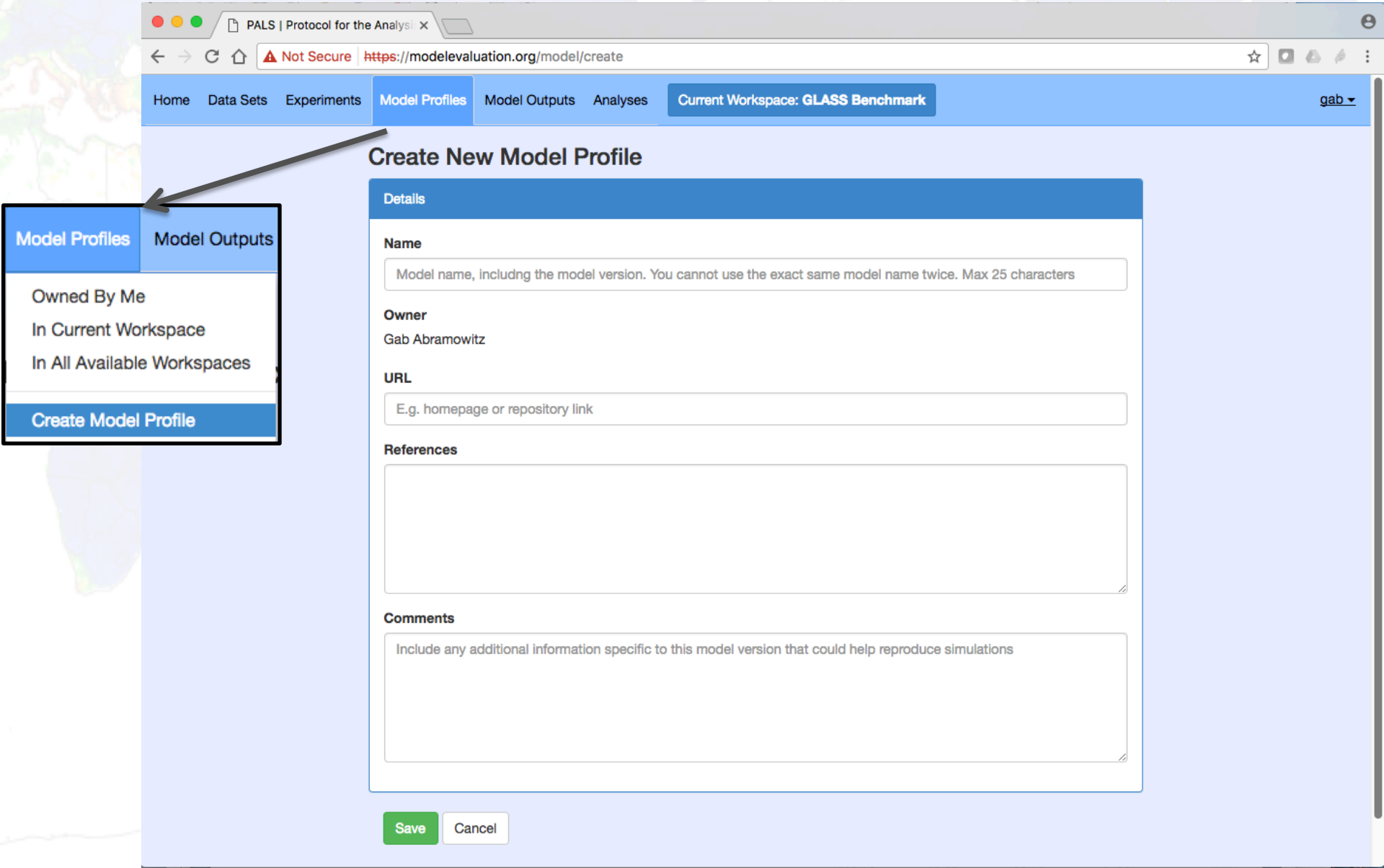


Using Experiments – MIP or development environment
Creating a Model profile



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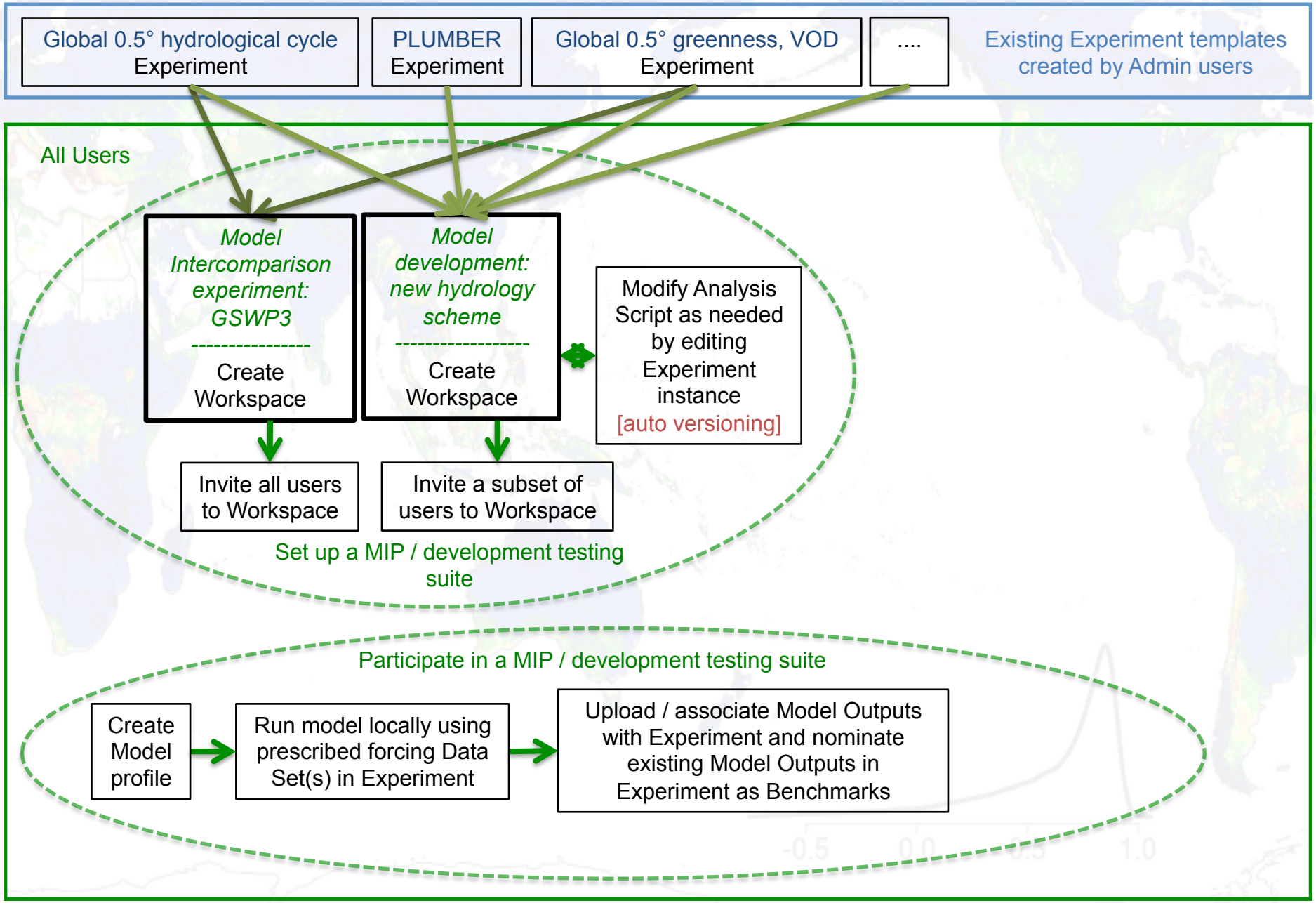
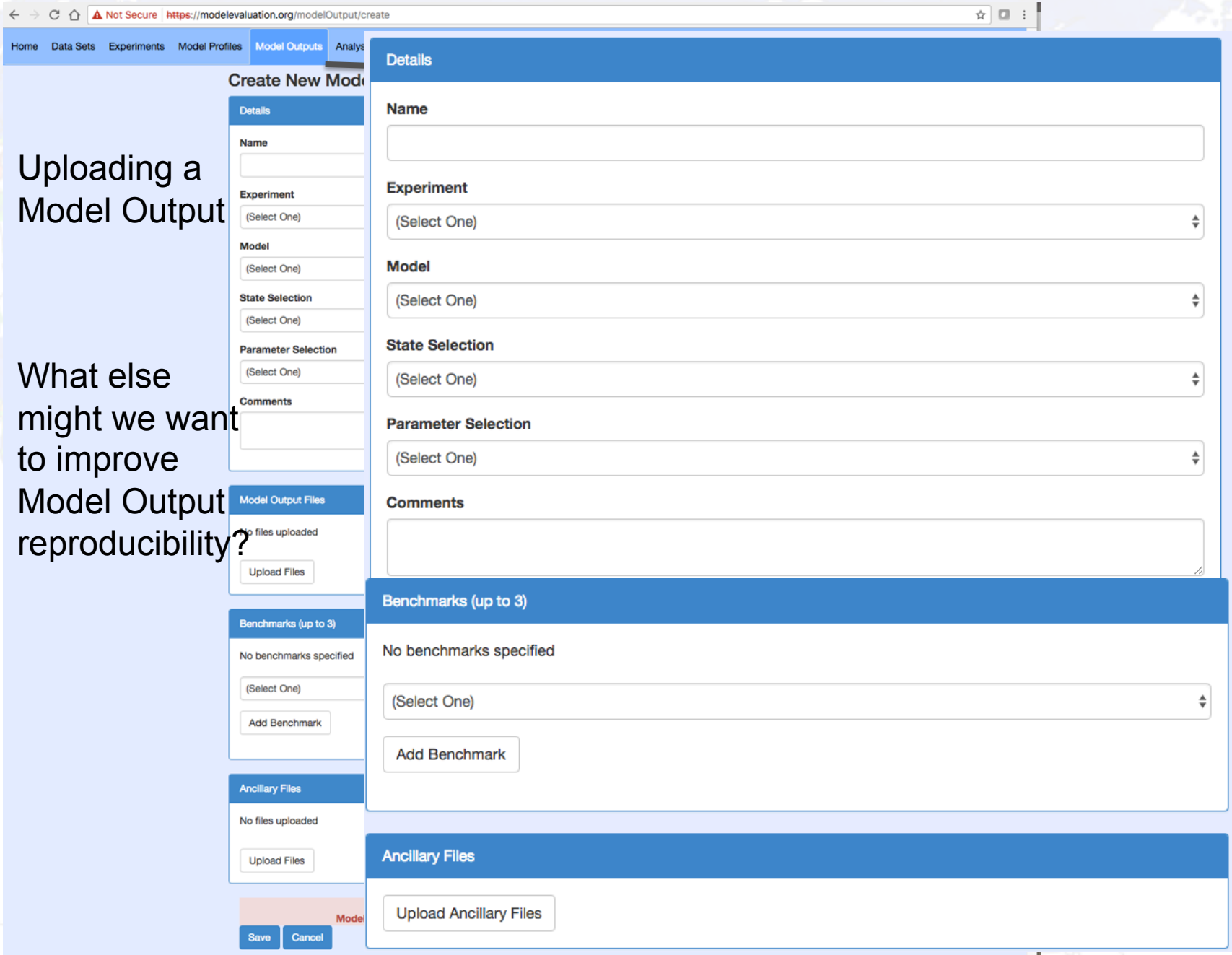


Using Experiments – MIP or development environment

Uploading a Model Output

What else might we want to improve Model Output reproducibility?

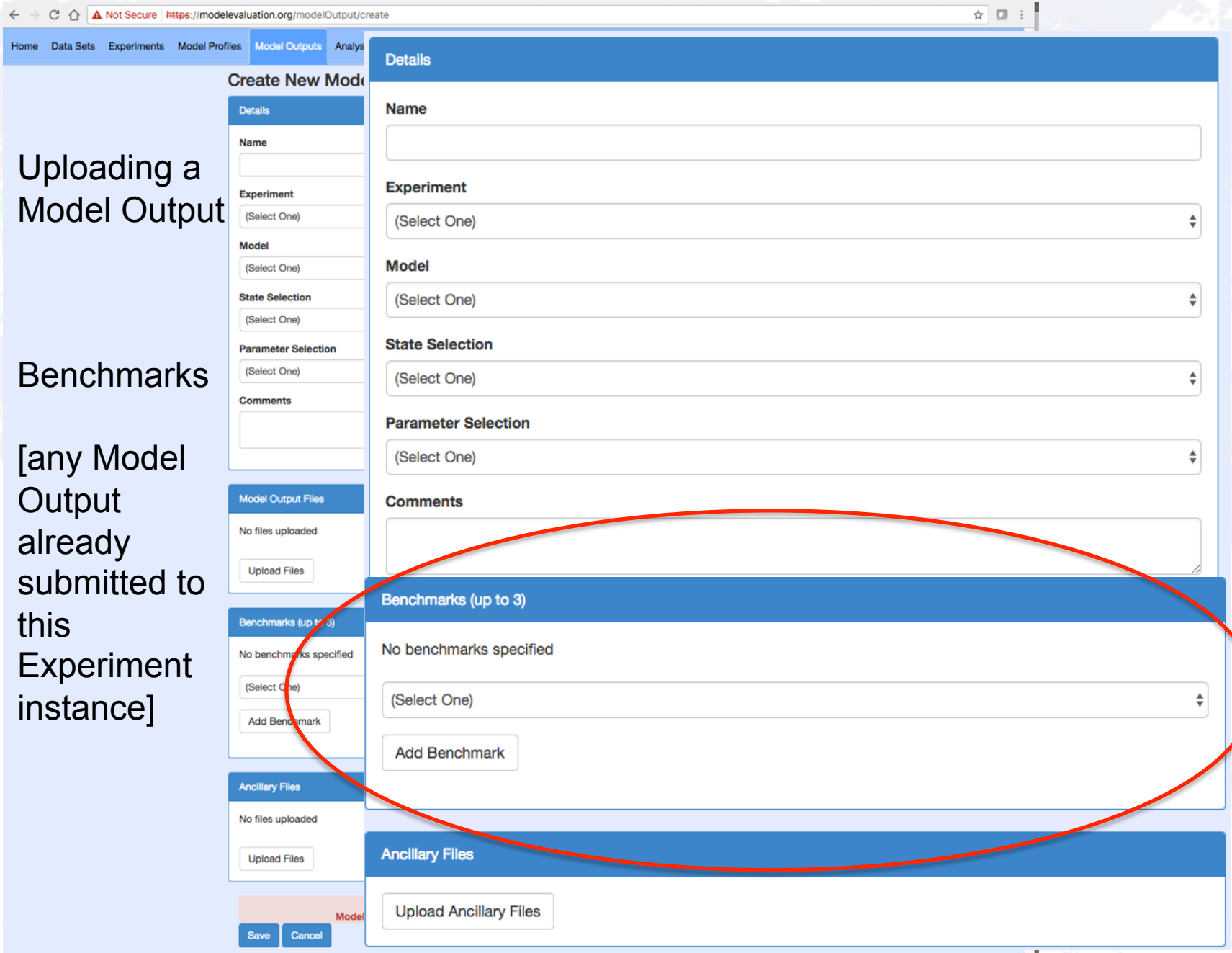


Using Experiments – MIP or development environment

Uploading a Model Output

Benchmarks

[any Model Output already submitted to this Experiment instance]



Using Experiments – MIP or development environment

Global 0.5° hydrological cycle Experiment

PLUMBER Experiment

Global 0.5° greenness, VOD Experiment

....

Existing Experiment templates created by Admin users

All Users

Model Intercomparison experiment: GSWP3

Create Workspace

Model development: new hydrology scheme

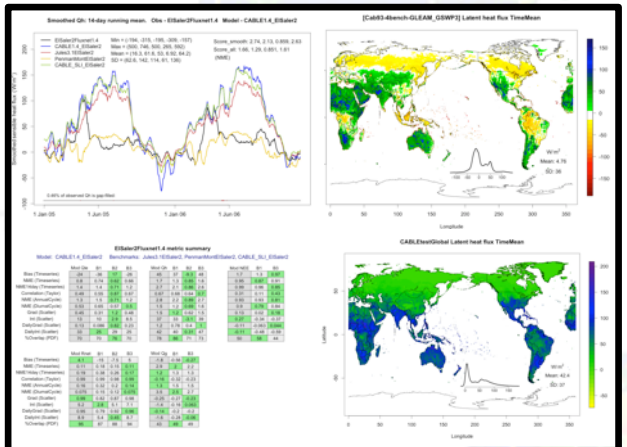
Create Workspace

Modify Analysis Script as needed by editing Experiment instance [auto versioning]

Invite all users to Workspace

Invite a subset of users to Workspace

Set up a MIP / development testing suite



Analyses viewable to users within the Workspace

Participate in a MIP / development testing suite

Create Model profile

Run model locally using prescribed forcing Data Set(s) in Experiment

Upload / associate Model Outputs with Experiment and nominate existing Model Outputs in Experiment as Benchmarks

Analysis Script is triggered

Experiment Analysis Script / integrating new analysis packages

Information sent to the Analysis Script when a Model Output is uploaded to a given Experiment (including paths, meta-data):

- All **Data Sets** associated with the Experiment
- All **Model Outputs** that have been uploaded to the Experiment (within current Workspace)
- Model Output that is being uploaded and is triggering the analysis
- User's nominated **Benchmarks** associated with this Model Output

Master Analysis Script

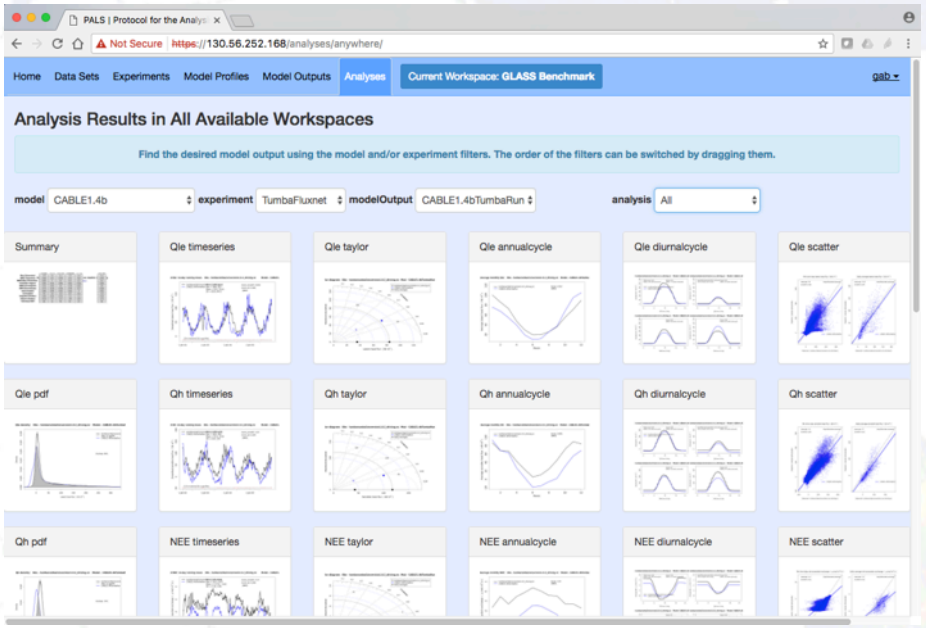
R

python

ILAMB Python package

HTML output

Analysis browser page uses these properties, as well as Experiment, Workspace to classify display panels



Default analysis returns:

- Paths to images
- Image types
- Analysis names
- Metric names and values
- Evaluation products used
- Model Outputs used
- Benchmarks used
- Analysis error messages
- Benchmark err messages

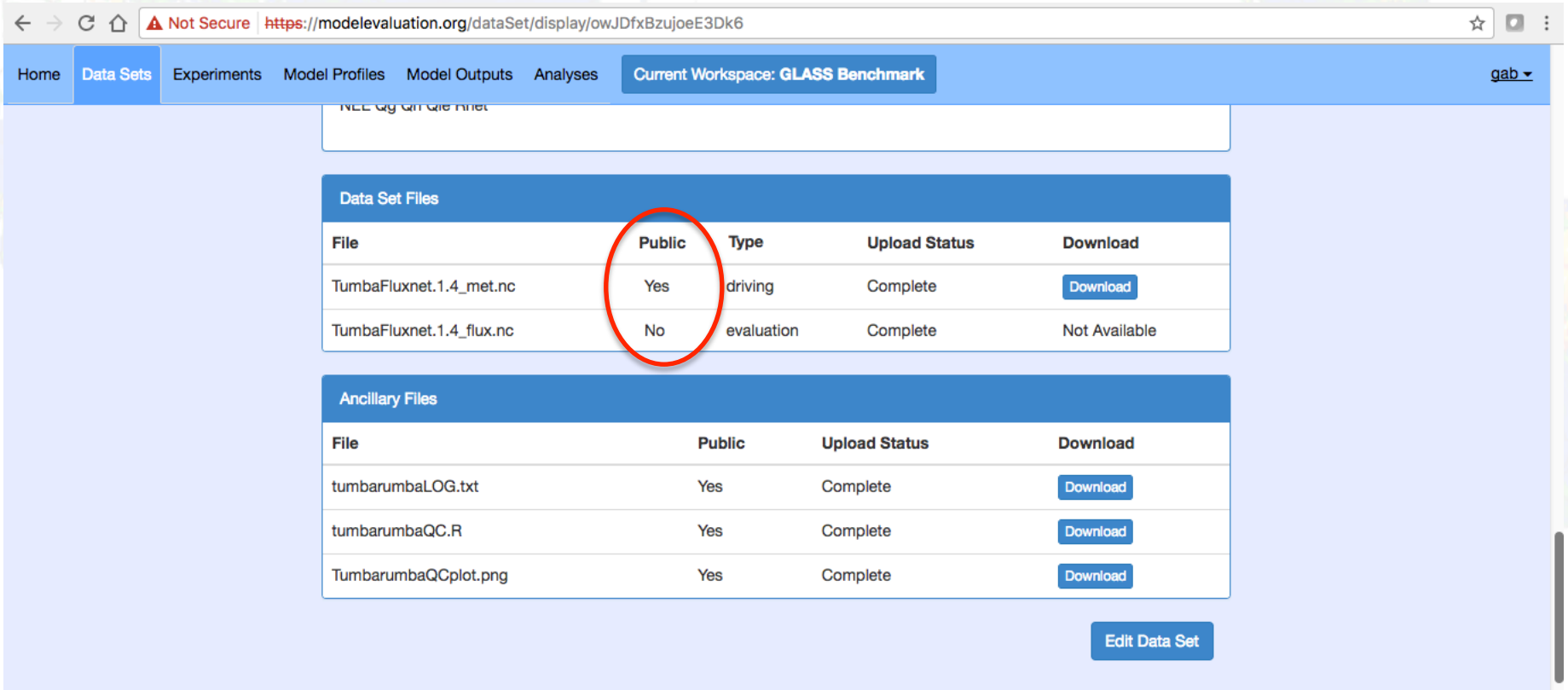
- The Analysis Script for a given Experiment might only use a fraction of this information to produce its analysis suite (e.g. only the triggering Model Output and a single evaluation product might be compared).

Implementation vision

- Analysis is not restricted to a particular package / language (e.g. R, Python, NCL) – plan to include ILAMB, LVT
- Distributed architecture will allows analysis to be co-located with big data:
  - 'Worker' nodes (e.g. R / Python analysis servers) to be installed locally across multiple locations, co-located with large data sets
  - 'Upload' of files to the system simply stores path: (a) if local worker node is present, files are not copied (b) local worker not present, files are uploaded
  - Analysis routing is strategized, depending on proximity and load of workers
- API access could allow remote continuous integration testing of *science* in model, not just code, e.g. Jenkins
- System can be used with any model type – not land surface specific

Features

- When admin users create/edit Data Sets, evaluation files can be marked as non-downloadable, but still accessible to analyses



Features

- Potential to data mine ancillary information as part of analyses

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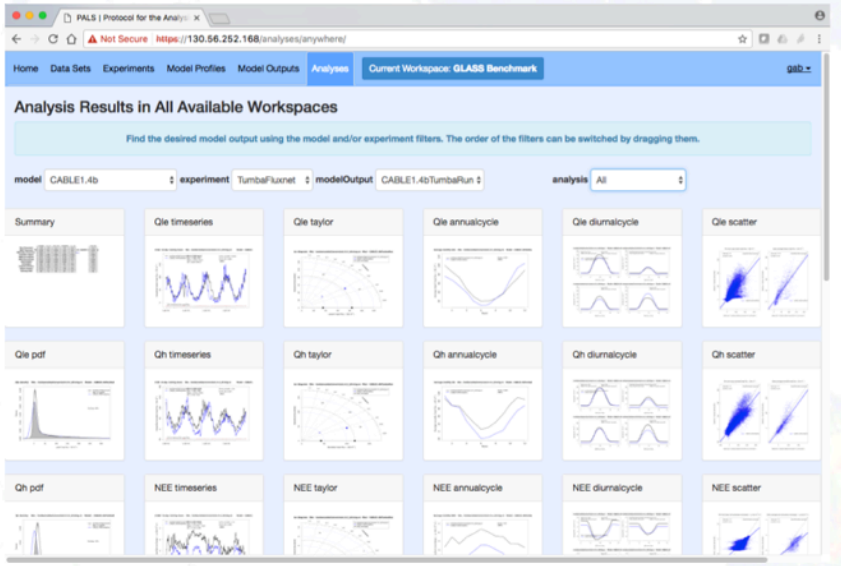

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Features

- MIPs are transparent – analysis scripts are viewable, experiments can be replicated

- MIPS are ongoing:
  - new model additions will automatically be analysed (can be in the original MIP workspace, or in a private development workspace)
  - New analyses can be added retrospectively

- Imagine having GSWP phases, PILPS experiments, PLUMBER, GLACE (et al) data still available and analysable – quickly.

Questions

- What additional measures are needed to improve reproducibility?
- What kinds of new features might improve usability?
- What do you see as the limitations of this type of system?