LCZO Data

1) **Existing Systems**
2) **Data streams and sampling**
3) **New LCZO Data site**
4) **Other Uses and Suggestions**

Existing Live Data Site

https://www.sas.upenn.edu/lczodata/

1) Allows for the specification of meta-data and the generation of .hdr files
2) Drupal based
    1) Has disadvantage of difficult to parse database structure.
3) Datasets on criticalzone.org linked here.
4) Data stored as .csv files.
5) We have a web GIS application at:
    1) http://gis.lczodata.com/mappingApp/index.html

Intensively monitored Hillslope.

Continuous measurements of soil greenhouse gases via 9 automatic chamber for continuous measurement of soil CO_2, CH_4, and NO_2 fluxes

30 soil O_2 sensors, 30 Soil moisture and Temperature sensors on

Ground and Stream Water Site Chemistry

Several Stream and groundwater sites with conductivity, dissolved oxygen(DO) loggers, and water level

New Stream Monitoring Site with:

- YSI Sonde EXO2 multiprobe
  - fDOM ,Turbidity, pH, Total Algae, Optical DO, Conductivity/Temp Sensors
- Satlantic SUNA Nitrate Sensor

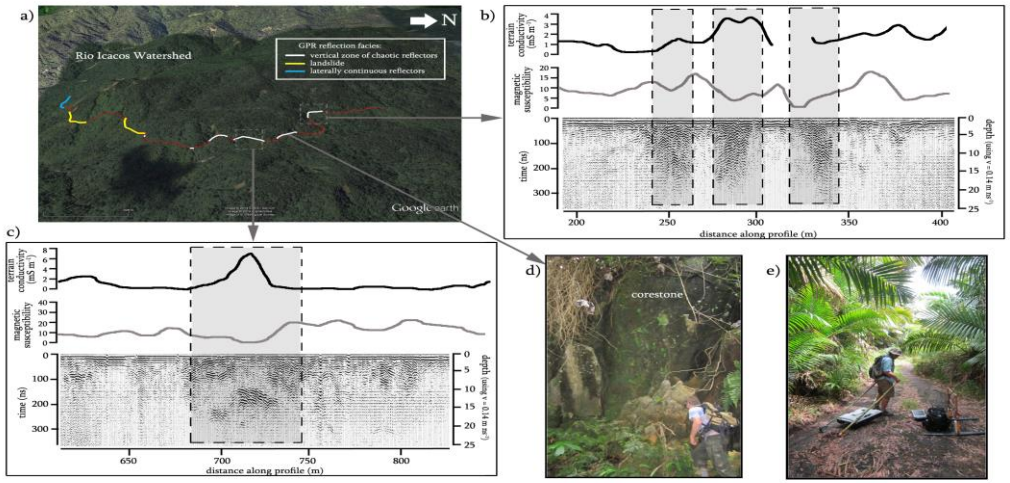
Groundwater with
Hydrolab MS5 multi-parameter Sondes
Conductivity, Dissolved Oxygen loggers, and Water level, ORP, pH, NO_3, NH_4,

Soils Data Include:

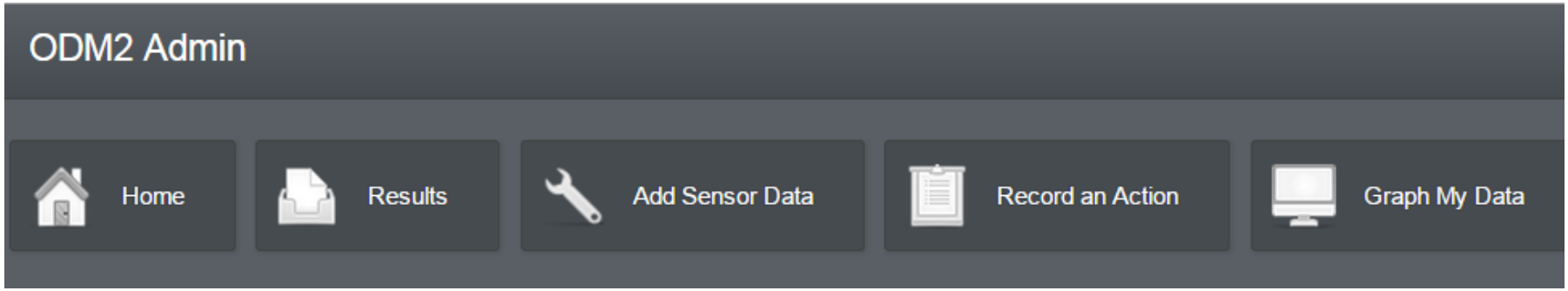
- 216 profiles representing 24 sites in the El Yunque National Forest to determine amounts C, N, Ca, Mg, K
- 149 samples at 15 sites for soil carbon, texture and many attributes for Fe, Al (now in ODM2)

Other Data Streams Include:

- 4 weather stations managed by USFS and UPR
- 10 Gaged Streams (USGS, USFS and LCZO)
- Ceilometer
- Cloud Forest measurements for African dust inputs, cloud water precipitation, and visibility
- Stream chemistry sampling for 10 sites, since 1983.
- Geophysical Surveys – Ground Penetrating Radar (GPR), terrain conductivity and electrical resistivity imaging (ERI)



‘ODM2 Admin’ New Data Management Application for the LCZO



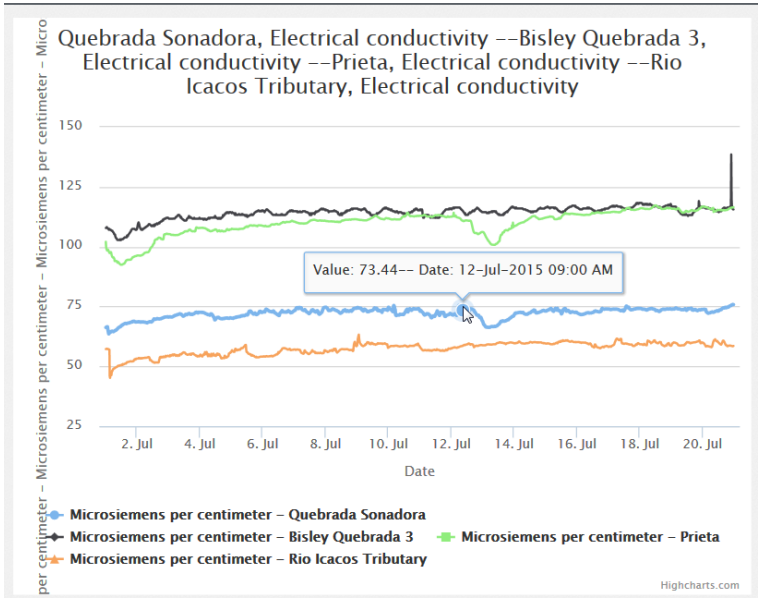
https://github.com/miguelcleon/odm2djangoadmin

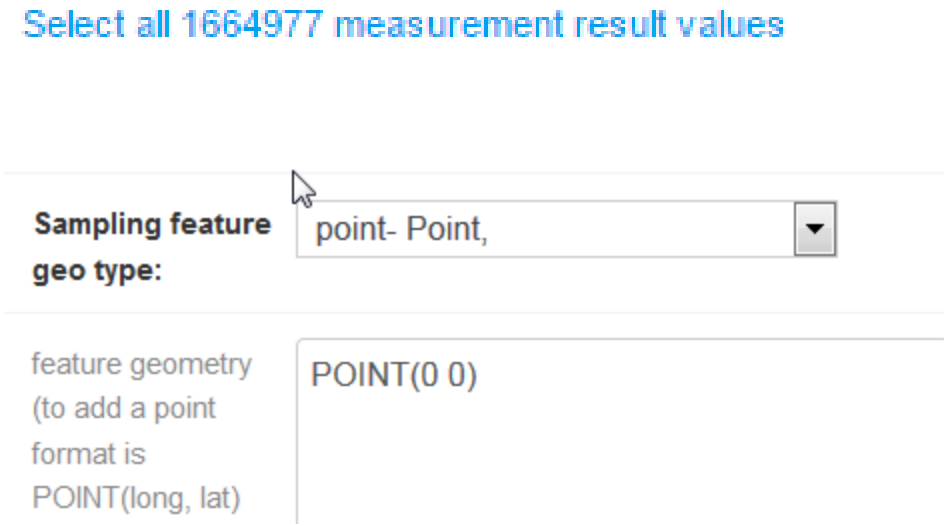
New Data Management Application

- The site is online at http://lczodata.com/ODM2/
- ODM2 in Postgresql

Tech and Data So Far

- Based on Django web platform
  - Python, POSTGIS, Highcharts,
- Data in ODM2 include 176 variables collected by 30 sensors with 1.6 million+ data values.
- 408 soil profile results
- water chemistry derived products



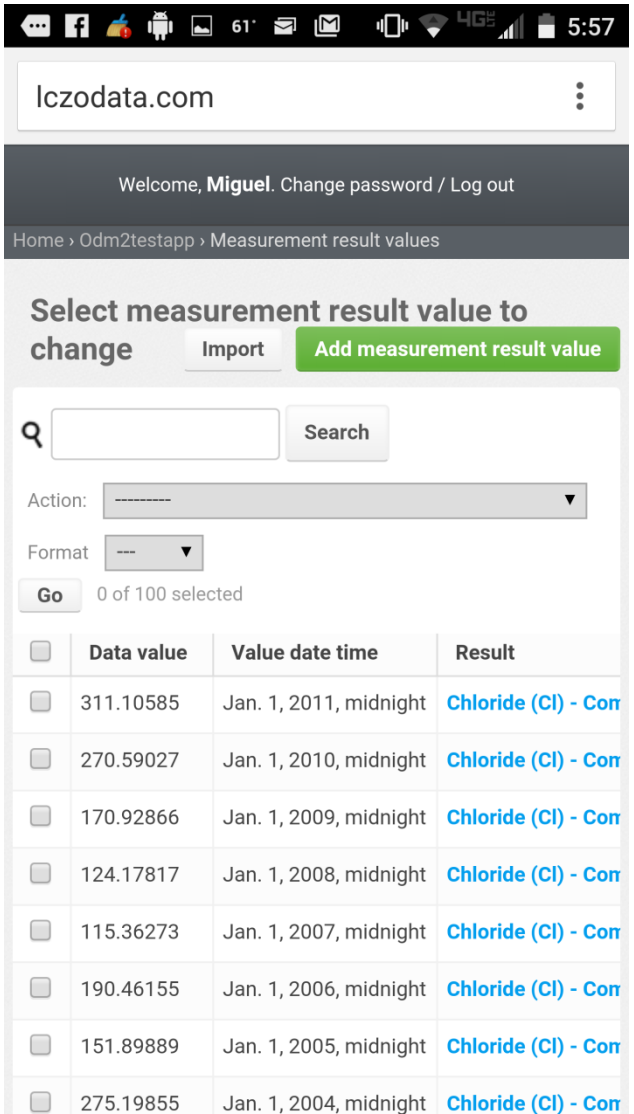


Derived Products

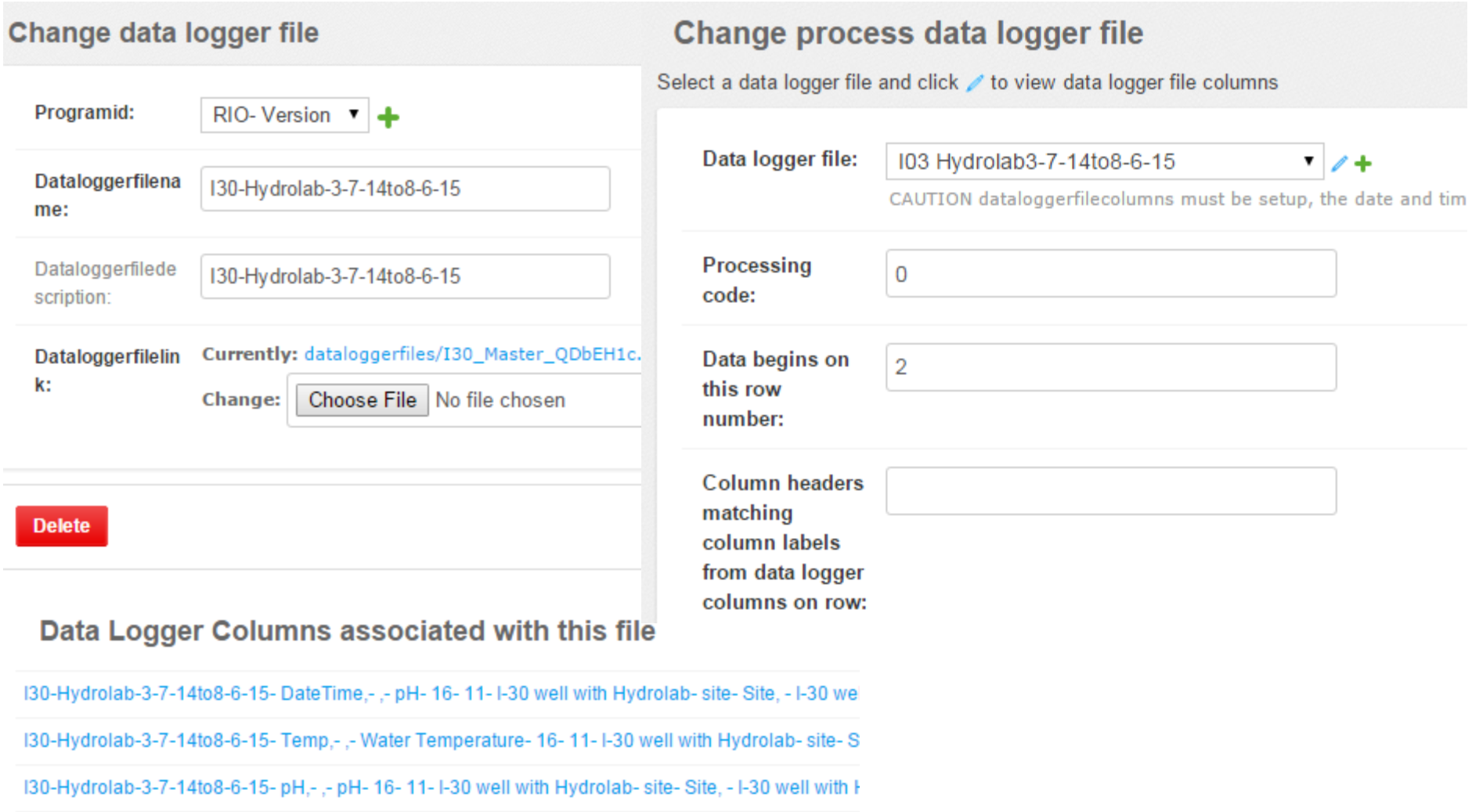
- water chemistry derived products from Loadflex
- Use data management to gain new scientific insights
- Tools for flux and concentration estimation
  - Interpolation
  - Regression
  - Composite method (Alunbach & Hooper 2006)
- Loadflex is also on github.com https://github.com/McDowellLab/loadflex

Advantages of ODM2 Admin

- Record important events such as instrument maintenance, calibrations, sampling, sub-sampling, multi-step lab procedures, and many others.
- Works on Smartphones and Tablets.

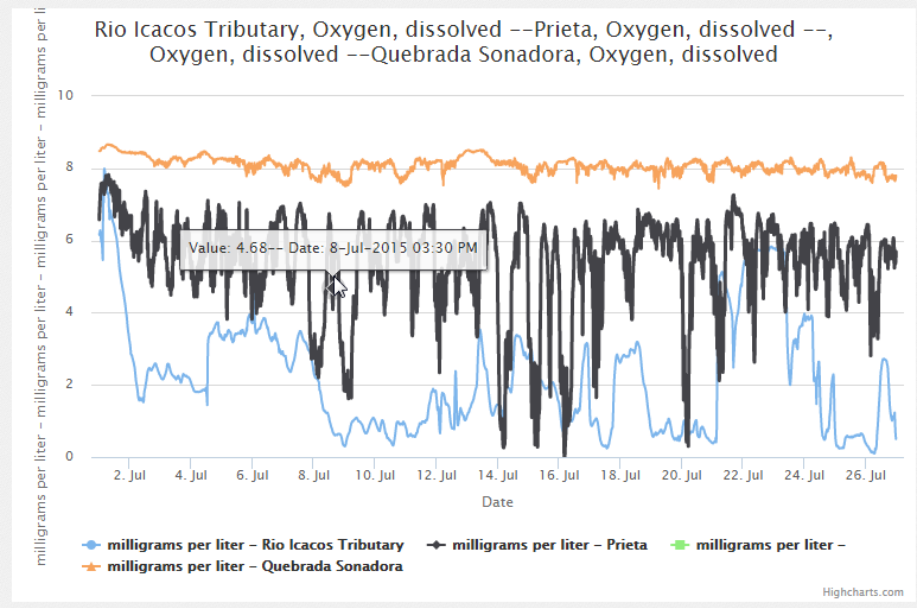


Importing and exporting data



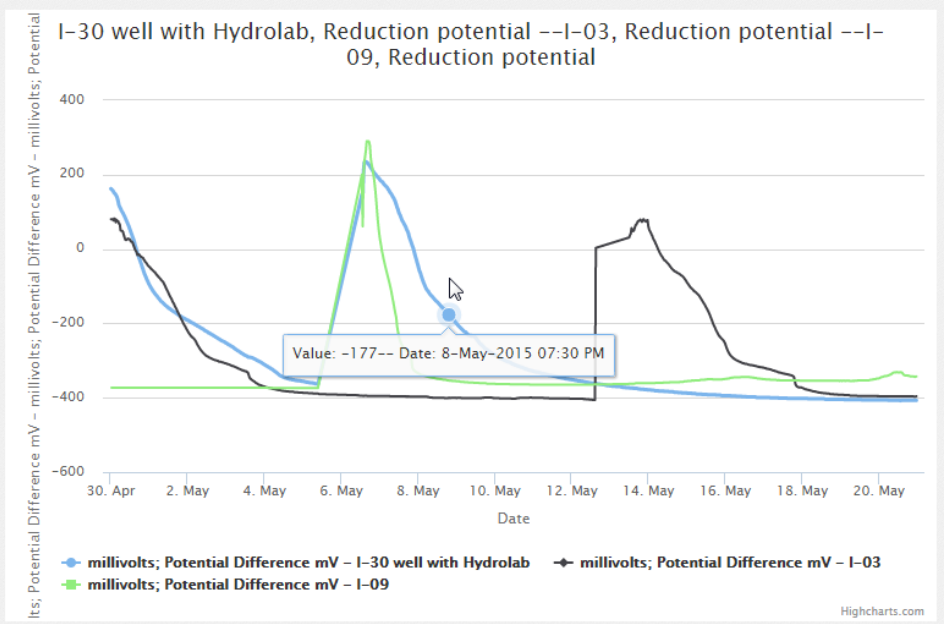
Data in ODM2

DO



- HOBO Conductivity, DO, Water level loggers

ORP



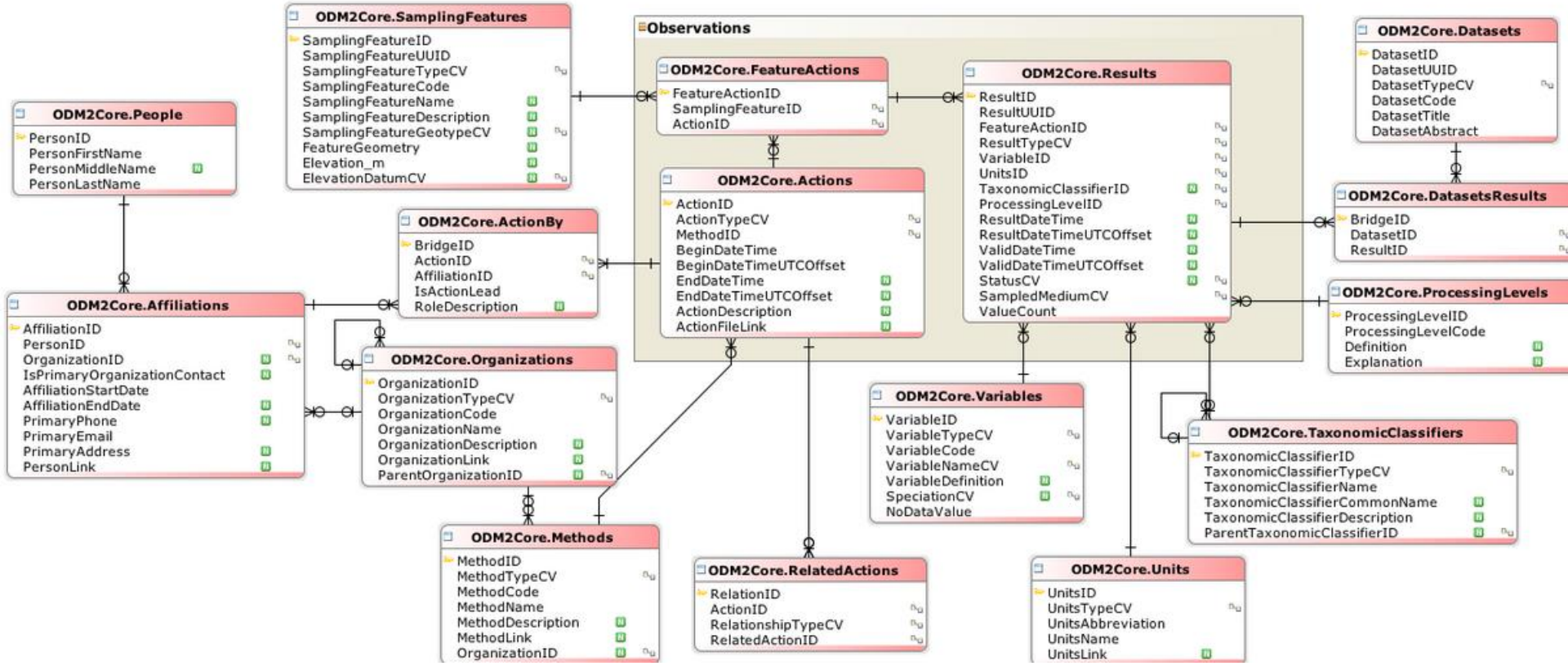
- Groundwater Hach MS5 HydroLab

Stream chemistry derived products.

Soils: Carbon, Texture, Fe, Al, and Soil moisture sensors.

Data Coming Soon to ODM2 Admin

- Instrumented hillslope data
- Stream chemistry data from sampling
- Near real-time data stream from water chemistry sensors
- More soils data
- More derived stream chemistry data from Loadflex.

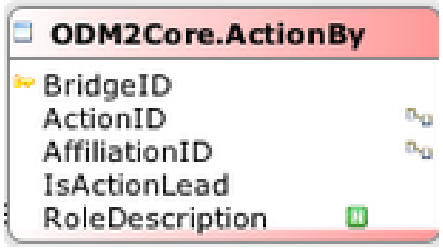


- Object relational mapping for ODM2 Core – 16 entities and 14 additional entities

Example of a Django Model

```
class Actionby(models.Model):
    bridgeid = AutoField(primary_key=True)
    actionid = ForeignKey('Actions')
    affiliationid = ForeignKey('Affiliations',
    verbose_name="person by affiliation“)
    isactionlead = BooleanField()
    roledescription = CharField(max_length=500)
    class Meta:
        managed = False
        db_table = 'actionby'
        verbose_name='action by'
        verbose_name_plural='action by'
```

SQL Table

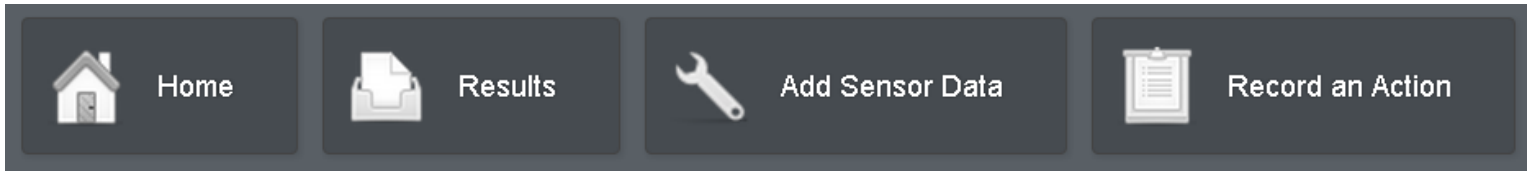


Python manage.py inspectdb > models.py

Automatically generates models from a database.

Tools

- Plot data
  - Plots are completely dynamic, after adding a new data series it can be immediately plotted.
- Django Packages Are easy to use.



- Planning to rely on ODM2 tools for generation of YODA files.

Others using ODM2 Admin

- ODM2 Admin is Redepolyable and can be leveraged by other projects
  - Instance deployed for TRACE
  - Interest in adding ODM2 Admin to the Big CZ Toolbox

TRACE – Tropical Response to Altered Climate Experiment

- 4 °C warming; on a 16 m^2 plot
- 18 soil O2, temp, and moisture probes
- GhG with automated sampling chambers
- First Field warming experiment in the Tropics.

Just scratching the surface

- ODM2 132 entities, ODM2 Admin currently using 30 of these.
- Site is functional but still in development
  - Requires a login
- Planned features:
  - Additional QA processing
  - Additional GIS features
  - Design additional work flows such as ‘Add Sensor Data’ and ‘Record an Action’
  - Public facing view of data

Suggestions for ODM2

- A relatedMethods table, this would allow methods to have hierarchy and multiple steps.
- ProfileResults should have an intended aggregation interval and intended aggregation units like profileResultsValues table.