

# OGH

Observatory for Gridded Hydrometeorology  
Python library

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- 20 min – presentation on OGH
- 30 min – small group activity
- 30 min – large group discussion

# Start tutorial

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## Tutorial for NetCDF climate data retrieval and model integration

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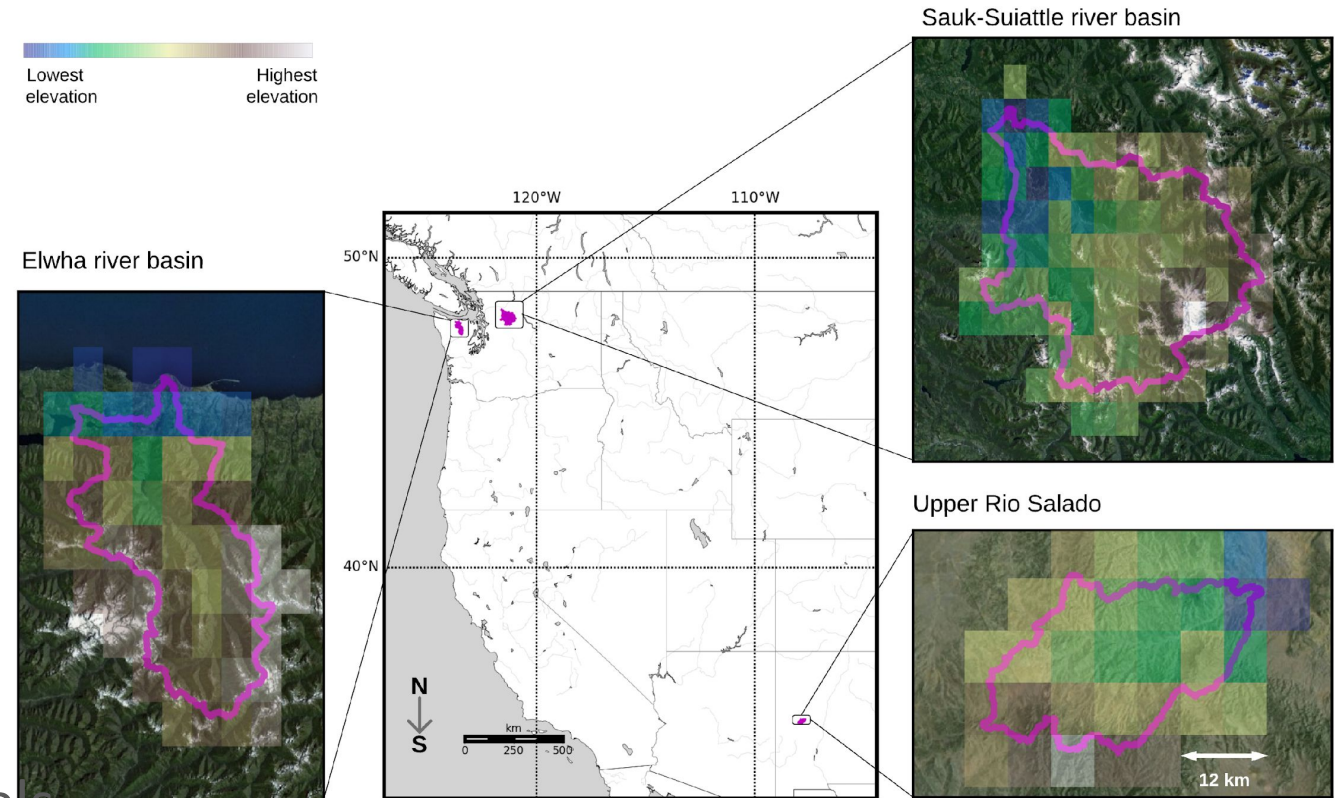
### Abstract

Hydrological and meteorological information can help inform the conditions and risk factors related to the environment and their inhabitants. Due to the limitations of observation sampling, gridded data sets provide the modeled information for areas where data collection are infeasible using observations collected and known process relations. Although available, data users are faced with barriers to use, challenges like how to access, acquire, then analyze data for small watershed areas, when these datasets were produced for large, continental scale processes. In this tutorial, we introduce Observatory for Gridded Hydrometeorology (OGH) to resolve such hurdles in a use-case that incorporates NetCDF

- Automate access to data repositories
- Visualize gridded data on a map
- Analyze large volumes of gridded data
  - Basic spatial-temporal statistics
  - Exceedance probabilities
- Integrate data with earth surface models
  - Landlab vegetation model case-study

# OGH functionalities

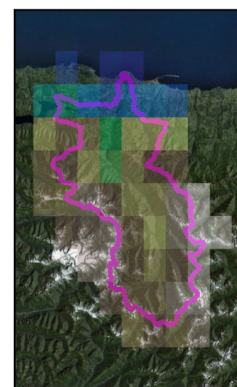
- Automate access to data repositories
- Visualize gridded data on a map
- Analyze large volumes of gridded data
  - Basic spatial-temporal statistics
  - Exceedance probabilities
- Integrate data with earth surface models
  - Landlab vegetation model case-study



# How long it would take?

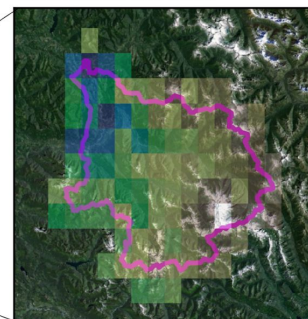
55 cells (0.06° buffer)

Elwha river basin

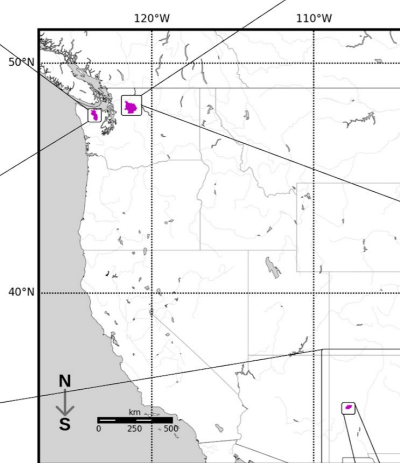


Lowest elevation  
Highest elevation

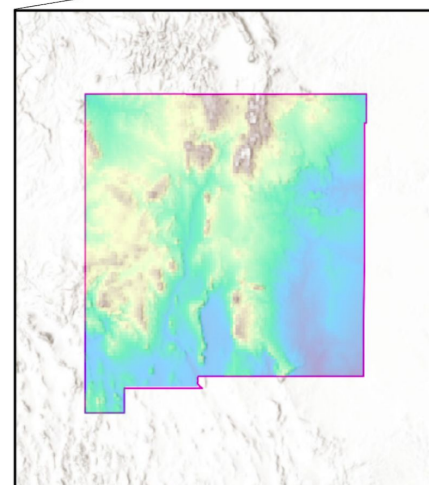
Sauk-Suiattle river basin



99 cells (0.06° buffer)



New Mexico state



7917 grid cells (0 buffer)

Upper Rio Salado



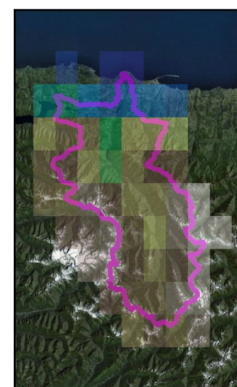
31 cells (0.06° buffer)



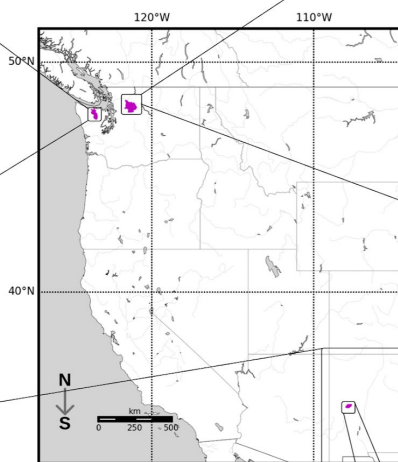
# Human Readable Inspection

55 cells (0.06° buffer)  
15 sec/dataset  
download

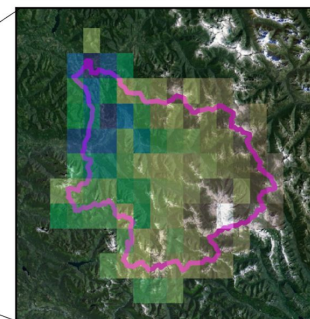
Elwha river basin



Lowest elevation  
Highest elevation

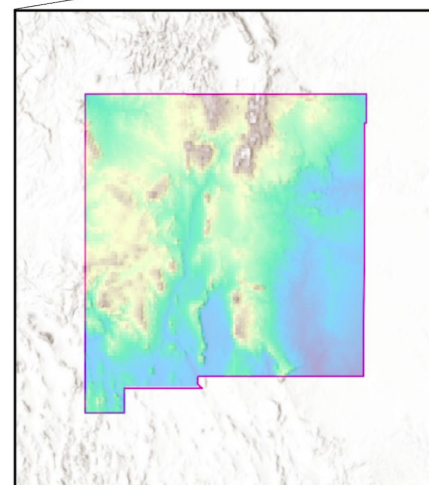


Sauk-Suiattle river basin



99 cells (0.06° buffer)  
25 sec/ dataset  
download

New Mexico state



7917 grid cells (0 buffer)  
28 min/data set  
download

Upper Rio Salado



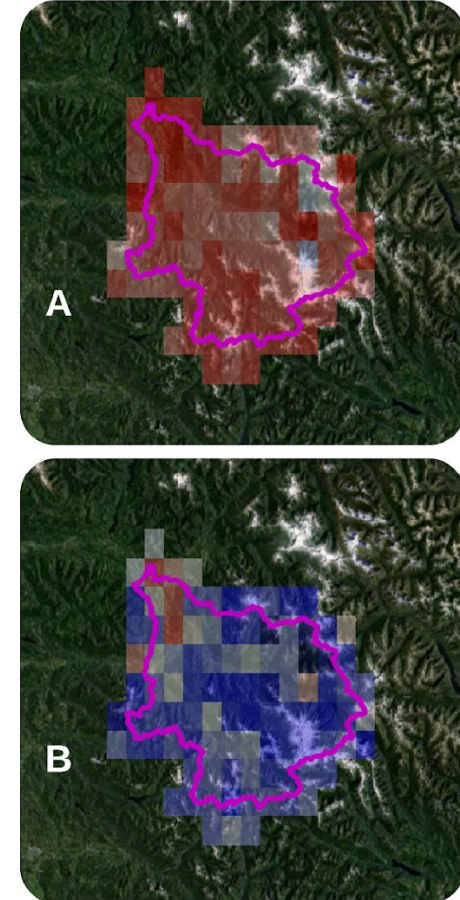
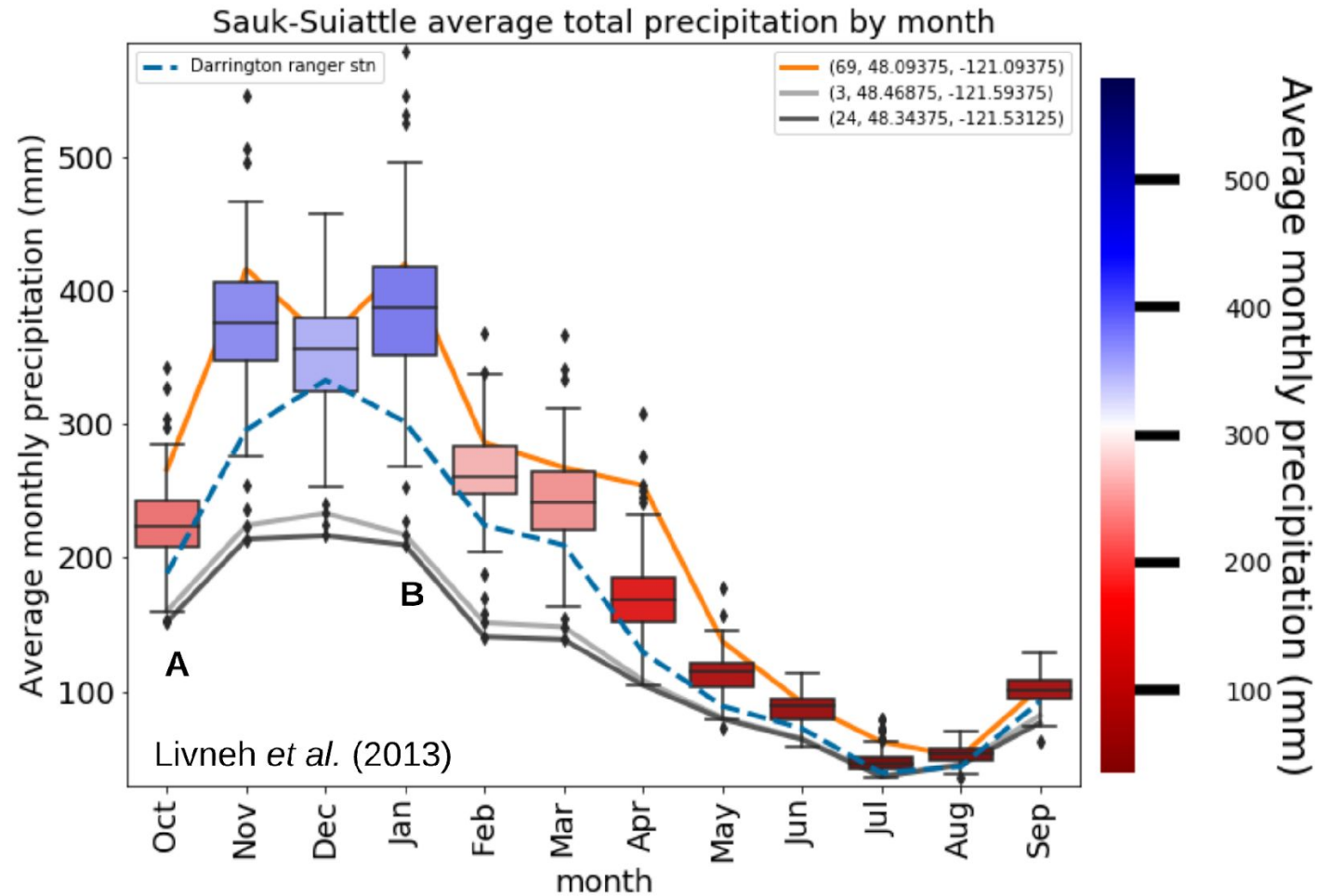
31 cells (0.06° buffer)  
13 sec/data set  
download

# Summarize data availability

Median Elevation in meters [range] (Number of gridded cells)	Watersheds		
	Sauk-Suiattle river	Elwha river	Rio Salado
	1171[164-2216] (n=99)	1020[36-1642] (n=55)	2308[1962-2669] (n=31)
<b>daily</b> met_bclivneh2013	1171[164-2216] (n=99)	1120[36-1642] (n=55)	0
<b>daily</b> met_livneh2013	1171[164-2216] (n=99)	1146[174-1642] (n=52)	2308[1962-2669] (n=31)
<b>daily</b> met_livneh2015	1171[164-2216] (n=99)	1120[36-1642] (n=55)	2308[1962-2669] (n=31)
<b>daily</b> vic_livneh2013	1171[164-2216] (n=99)	1146[174-1642] (n=52)	2308[1962-2669] (n=31)
<b>daily</b> vic_livneh2015	1171[164-2216] (n=99)	1120[36-1642] (n=55)	2308[1962-2669] (n=31)
<b>daily</b> wrf_salathe2014	1171[164-2216] (n=99)	1142[97-1642] (n=53)	0
<b>daily</b> wrf_bcsalathe2014	1171[164-2216] (n=99)	1142[97-1642] (n=53)	0



# Summarize Trends



# Examples catalog of gridded data sets

<a href="#">GISS surface temperature analysis</a>	Goddard Institute for Space Studies (GISS/NASA) surface temperature analysis for the globe; globally gridded at a 2x2 resolution.	<a href="#">Catalog</a>
<a href="#">NCEP GODAS ocean analysis</a>	High Resolution Multi-level ocean analysis from NCEP	<a href="#">Catalog</a>
<a href="#">Global Precipitation Climatology Centre (GPCC)</a>	GPCC Global Precipitation Climatology Centre monthly precipitation dataset from 1901-present is calculated from global station data.	<a href="#">Catalog</a>
<a href="#">GPCP V2.3 Precipitation</a>	Global Precipitation Climatology Project monthly precipitation dataset from 1979-present combines observations and satellite precipitation data into 2.5°x2.5° global grids.	<a href="#">Catalog</a>
<a href="#">ICOADS</a>	Global surface marine data from 1800 to near the present summarized in monthly gridded formats (2°x2° boxes, or 1°x1° boxes from 1960 forward), and offering a variety of statistics.	<a href="#">Catalog</a>
<a href="#">Interpolated OLR</a>	Gridded daily and monthly OLR data from NCAR with temporal interpolation. See the related <b>Uninterpolated OLR</b> dataset.	<a href="#">Catalog</a>
<a href="#">Kaplan SST</a>	Gridded global SST anomalies from 1856-present derived from UK Met Office SST data which has had sophisticated statistical techniques applied to it to fill in gaps.	<a href="#">Catalog</a>

# Minimum Annotation Criteria

Metadata	Metadata descriptions
<b>File location</b>	
1. Dataset	name of the gridded data product
2. Spatial resolution	the distance between gridded cell centroids
3. Web protocol	the data transfer protocol
4. Domain	the web domain
5. Subdomain	the subdomain path
6. Decision steps	the file organization for locating data files
7. Filename structure	the standard components to the filename
8. File format	the file type at download
<b>File structure</b>	
9. Start date	the start date of the time-series
10. End date	the end date of the time-series
11. Temporal resolution	the unit increment for time-steps
12. Delimiter	the column separator within each line of data
13. Variable_list	the list of variables in order of appearance
14. Reference	the sources of metadata
<b>Variable structure</b>	
15. Variable_info	
• desc	the long name of the variable
• dtypes	the expected data type
• units	the unit increment of the data



# SMALL GROUP ACTIVITY

TUTORIAL: <https://bit.ly/2JsmTMJ>

## ROLES

ARCHITECTS are interested in where objects are. Your objective is to draw a visual representation of the workflow with where files are and what functions led to their finished output files.

ACCOUNTANTS are interested in the numerical count of things. Your objective is to figure out how many data objects are inputs and outputs from the OGH functions. Identify what steps have functions that are slow.

## GOAL

Get into groups of 4-5. Each participant picks a role with at least one role type per group. Work through the use-case notebook and discuss each step of the 8 steps with your groupmates, while noting observations as your player role to reach your objectives.

## EXPECTED OUTCOME

- A drawing of data and workflow
- Numbers for the number of objects involved.

**HINT:**  
**SOME FUNCTIONS HAVE  
MULTIPLE OUTPUTS**

# Discussion questions

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Please answer the following questions on a Post-It canvas

- **Key objects:** What are important data files or object names that you noticed?
- **Fast or slow:** Which steps are relatively slow? Relatively fast?
- **Clarification:** Was there something that your group struggled to figure out?
- **User control:** Did you try changing different parameters in the tutorial?