WSU FY24 October Report

For the NW-AIRQUEST Consortium

Von P. Walden, Amin Vahidi, Ana Carla Fernandez-Valdes
26 October 2023

Personnel

Personnel

- Dr. Von P. Walden - Principal Investigator / Group Leader
- Dr. Amin Vahidi - Postdoctoral Fellow
- Ana Carla Fernandez-Valdez - Graduate Student

- Joe Vaughan - LAR and NW-AIRQUEST colleague (consultant)

Update on New LAR modeling position

- The WSU CEE has hired a new assistant professor in the general area of chemical transport modeling
  - **Dr. Jun Meng** (currently at Environment and Climate Change Canada)
    - Developer and maintainer of GEOS-Chem
    - Working on health effects of Polycyclic Aromatic Hydrocarbons (PAH) in Canada
  - Replacement for Yunha Lee / Brian Lamb
  - Anticipated start date is January 2024 (or whenever US visa is acquired)

Budget Status

FY24 Budget

- **Salaries** = $77,604
  - 8.4 months - Amin Vahidi (postdoc)
  - 4 months (1 semester) for a future graduate student (Jun Meng)
- **Travel** = $1,528
- **Web maintenance** = $10,000
- **HPC Equipment** = $41,000
- **WSU overhead** (12%) = $9,868
- **TOTAL = $140,000**

Budget Status

- FY24 is the second year of a two-year (biennium) budget

- Current remaining budget for FY24 is $86,498
  - Primarily equipment ($40,000), a bit of travel, and Amin’s salary

Equipment

Equipment update

- The Aeolus HPC cluster continues to run the AIRPACT5 modeling system each night.

- Both AIRNAS1 and AIRNAS2 are fully functional

- Forecast data from AIRPACT5 and the Machine Learning model are being backed up daily to AIRNAS1 (then mirrored to AIRNAS2)

On-going Tasks

ONGOING TASKS

- No major issues.

- Skipping, but can any address questions if needed.

ONGOING TASKS

Task	Status October 2023	
1. Provide daily forecasts of air quality for the three state region that can be used in daily AQ management.	DAY-ONE runs for Jul 2023 thru Oct 2023: (Success rate: 100%) DAY-TWO runs for Jul 2023 thru Oct 2023: (Success rate: Missed a couple of days)	

ONGOING TASKS

Task	Status October 2023	
2. Provide near real-time verification statistics of the current AIRPACT system accuracy by pollutant, by month, and Provide for user access to AIRPACT results and monitoring data for user-defined periods for download & analysis.	Statistics continue to be maintained.	

ONGOING TASKS

Task	Status October 2023	
3. Track and continue to improve model performance so that model predictions provide useful guidance for air quality forecasting.	Continuing; no issues.	

ONGOING TASKS

Task	Status October 2023	
4. Maintain ambient air monitoring data streams from AIRNow.	Continuing; no issues (Also have Python scripts for easy download upon request)	
5. Maintain satellite retrievals that are still functioning (except for MODIS and OMI).	Satellite data are no longer being actively archived	
6. Continue improvements and requested additions to web graphical display.	New AIRPACT website is online	

ONGOING TASKS

Task	Status October 2023	
7. Maintain the “Change Log”, posted on the AIRPACT website.	Ongoing. Now stored at GitHub; https://github.com/wsular/airpact	
8. Archive daily model output of the first 24 hours. Web-based graphical displays for each day’s first 24 hours of forecast should be available for the most recent 5 years & gridded files for at least one month.	Ongoing. Forecast graphics available beginning December 2015.	

ONGOING TASKS

Task	Status October 2023	
9. Modify AIRPACT as needed to respond to changes in fire emissions produced by other organizations. 10. Continue hosting the link to the latest background concentration lookup tool.	Ongoing as needed Hosted by IDEQ; Link will be added to AIRPACT site under Related Programs -> Graphics and Data	

ONGOING TASKS

Task	Status October 2023	
11. Modeling infrastructure maintenance and updates.	$40,000 investment in FY24 in 2 nodes (60 processes each; 120 total) in WSU HPC	

FY23 Carryover Tasks

TASKS CARRIED FORWARD FROM 2023

FY 2023 Task		Comments
1. Implement the **new AIRPACT6 forecasting framework** as a Singularity container for use on HPC systems		AIRPACT6 Apptainer container: • Container is based on Ubuntu 22.04 • Development is being tracked on GitHub • netCDF libraries - built and installed • OpenMPI - built and installed for HPC deployment • mcip, bcon, icon, jproc are compiled • Updated logging feature is implemented • MCIP conversion of UW WRF is running • Bluesky framework is running • Daily WACCM acquisition for BCON is running • SMOKEv5.0 is installed and compiled • MEGANv3.2 is installed, but not compiled • Still working on compilation of CCTM

TASKS CARRIED FORWARD FROM 2023

FY 2023 Task		Comments
2. Validate AIRPACT6 by running it concurrently with AIRPACT5 for six months. 3. Run validation case studies for ozone and PM2.5 for events using both AIRPACT5 and AIRPACT6.		Pending AIRPACT6 operations

TASKS CARRIED FORWARD FROM 2023

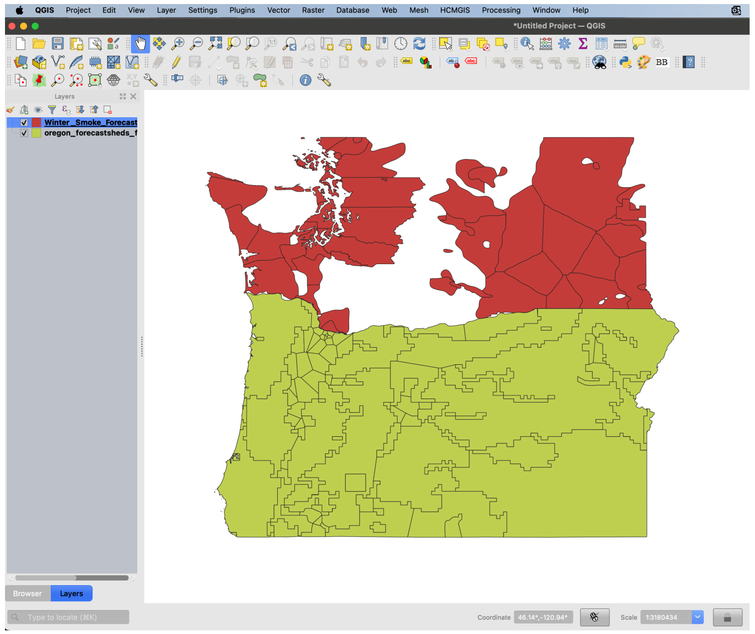
FY 2023 Task		Comments
4. **Extend the AIRPACT forecast period** from 48 h (2 days) to 72 h (3 days), in AIRPACT5		• Amin has completed the scripting for the 3rd day of AIRPACT5 forecasts • Still testing… • Anticipate full deployment this fall

TASKS CARRIED FORWARD FROM 2023

FY 2023 Task		Comments
5. **Continued improvement of Machine Learning forecast** system for ozone and PM2.5.		• LAR continues to run a new version along side original model • Training datasets were recently updated in new model (2017-2022) • PurpleAir data over AIRPACT domain have been downloaded for 2017-2022. • Interpolation will be implemented into LAR's version • This model framework is being integrated with WA Ecology's code; see below

TASKS CARRIED FORWARD FROM 2023

FY 2023 Task	Comments

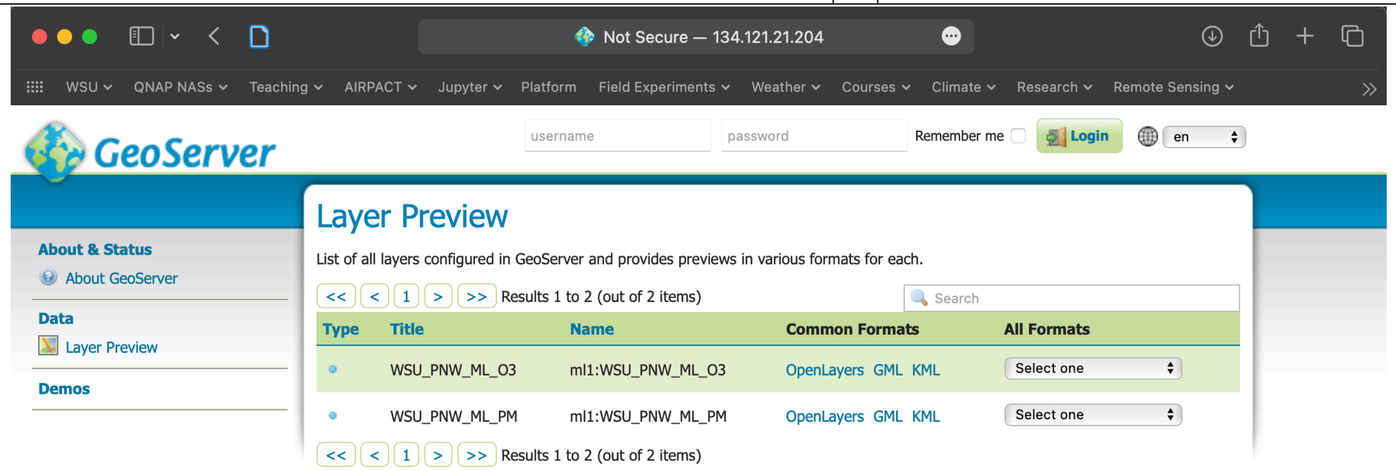
~~Collaborate with Ecology to~~ develop internal website for ML forecasts that cover WA, ID and OR 	• Created an Ubuntu 22.04 container with Python and R
	• LAR Python code and Ranil's R code and shape files are stored in container
	• Python model is running
	• Combined GIS files for WA and OR
	
	• R code is partially running
	  • Missing input files
	  • Convert to Python??
	• Create WSU website

TASKS CARRIED FORWARD FROM 2023

FY 2023 Task		Comments
Simple Air Quality Model (SAQM)		• Created an Ubuntu 22.04 container with Python • Phil Swartzendruber's Python code is installed and running for Tacoma • Easy to implement additional sites and to run on a regular schedule, if needed • Easy to distribute to others for use

TASKS CARRIED FORWARD FROM 2023 (funded by USDA project)

FY 2023 Task	Comments
Availability of LAR forecasting products (AIRPACT5, ML) via GIS server	• GeoServer tested internally at LAR • GeoServer has been deployed on WSU external server • Currently testing various GIS products (shapefiles, netCDF files)



TASKS CARRIED FORWARD FROM 2023

FY 2023 Task		Comments
6. Experimental **drone flights of opportunity** (e.g., wintertime inversion conditions)		Available per request

FY24 Tasks

2024 TASKS

FY 2024 Task		
Update to 2020 EPA National Emissions Inventory (NEI) as data become available.		Testing will begin soon now that SMOKEv5.0 is installed in the AIRPACT6 container Will ultimately be implemented in AIRPACT6

2024 TASKS

FY 2024 Task		
Incorporate updated Background Concentrations as data become available.		Still need to chat with Idaho about this…

2024 TASKS

FY 2024 Task		

Investigate the possibility of building an AIRPACT container that could run a sub- domain at finer spatial resolution (as requested by consortium members).		Thoughts…
		
		• UW WRF 4-km output could be used to run smaller domain at 800-meter resolution (similar to what Ana Carla is doing…)
		
		• AIRPACT6 container
		  • WRF model
		  • Re-run emissions, CCTM and plotting

Thank You!!

Questions?