

# WSU FY23 Annual Report

For the NW-AIRQUEST Consortium

Von P. Walden, Amin Vahidi, Ana Carla Fernandez-Valdes  
20 June 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

# FY23 Budget

- **Salaries** = \$92,000
  - 8 months - Amin Vahidi (postdoc)
  - 6 months (half-time) - Ana Carla Fernandez-Valdes (graduate student)
  - 1 month - Von P. Walden
- **Web maintenance** = \$7,000
- **WSU overhead (12%)** = \$11,000
- **TOTAL** = \$110,000

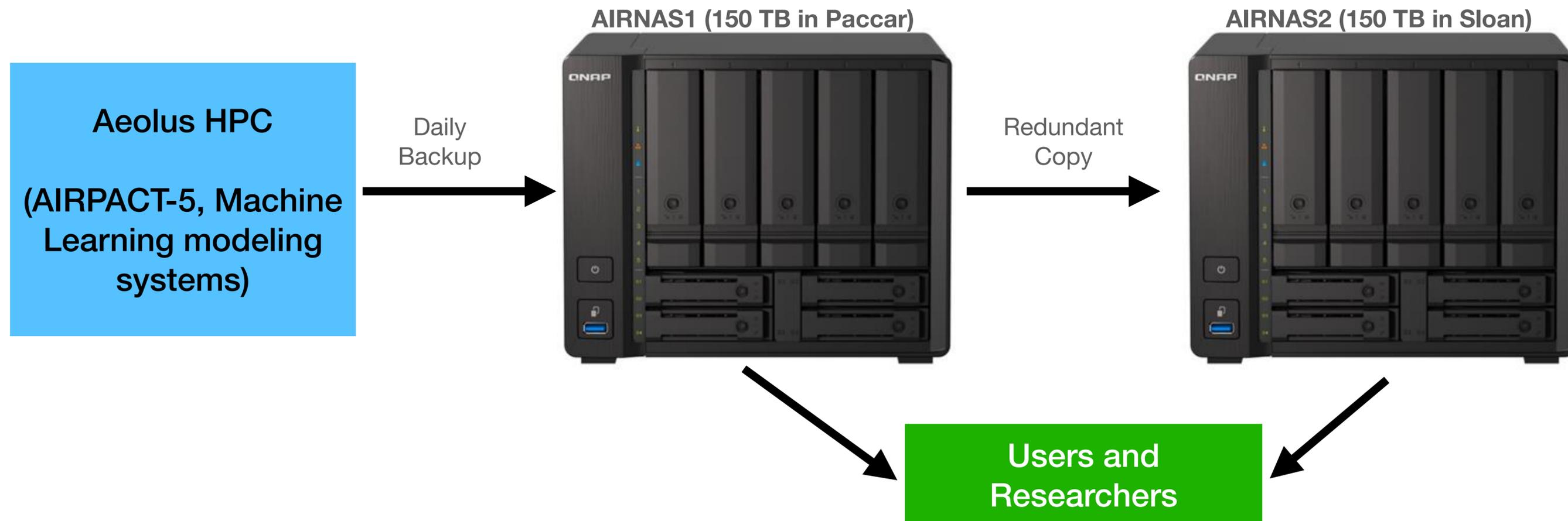
# Budget Status

- FY23 is the first year of a two-year (biennium) budget
- Budget for FY23 is \$110,000
  - Anticipated balance on 30 June 2023 = \$0.00

# Equipment

# Equipment update

- Both AIRNAS1 and AIRNAS2 are fully functional
  - AIRNAS2 is acting as a “mirror” of AIRNAS1



# Equipment update

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

<b>Task</b>	<b>Status October 2022</b>	
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 2022 thru Sep 2022: (Success rate: 100%)  DAY-TWO runs for Jul 2022 thru Sep 2022: (Success rate: Missed 3 days)	

# ONGOING TASKS

<b>Task</b>	<b>Status October 2022</b>
<p>2. Provide near real-time verification statistics of the current AIRPACT system accuracy by pollutant, by month, and</p> <p>Provide for user access to AIRPACT results and monitoring data for user-defined periods for download &amp; analysis.</p>	<p>Statistics continue to be maintained.</p>

# ONGOING TASKS

<b>Task</b>	<b>Status October 2022</b>	
<p>3. Track and continue to improve model performance so that model predictions provide useful guidance for air quality forecasting.</p>	<p>Continuing; no issues.</p>	

# ONGOING TASKS

<b>Task</b>	<b>Status October 2022</b>	
<p>4. Maintain ambient air monitoring data streams from AIRNow.</p> <p>5. Maintain satellite retrievals that are still functioning (except for MODIS and OMI).</p> <p>6. Continue improvements and requested additions to web graphical display.</p>	<p>Continuing; no issues</p> <p>Satellite data are no longer being actively archived</p> <p>New AIRPACT website is online</p>	

# ONGOING TASKS

<b>Task</b>	<b>Status October 2022</b>	
<p>7. Maintain the “Change Log”, posted on the AIRPACT website.</p> <p>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 &amp; gridded files for at least one month.</p>	<p>Ongoing. Now stored at GitHub; <a href="https://github.com/wsular/airpact">https://github.com/wsular/airpact</a></p> <p>Ongoing.</p> <p>Forecast graphics available beginning December 2015.</p>	

# ONGOING TASKS

<b>Task</b>	<b>Status October 2022</b>	
<p>9. Modify AIRPACT as needed to respond to changes in fire emissions produced by other organizations.</p> <p>10. Continue hosting the link to the latest background concentration lookup tool.</p>	<p>Ongoing as needed</p> <p>Hosted by IDEQ;</p> <p>Link will be added to AIRPACT site under Related Programs -&gt; Graphics and Data</p>	

# ONGOING TASKS

<b>Task</b>	<b>Status October 2022</b>	
11. Modeling infrastructure maintenance and updates.	Continuing; no issues.	

# FY23 Tasks

# TASKS CARRIED FORWARD FROM 2022

FY 2023 Task	Comments
1. Implement the <b>new AIRPACT6 forecasting framework</b> as a Singularity container for use on HPC systems	<p><u>AIRPACT6 Singularity container:</u></p> <ul style="list-style-type: none"><li>• Container is based on Ubuntu 22.04<ul style="list-style-type: none"><li>• Development is being tracked on GitHub</li></ul></li><li>• netCDF libraries - built and installed</li><li>• OpenMPI - built and installed for HPC deployment</li><li>• <b>mcip, bcon, icon, jproc are compiled</b></li><li>• <b>Still working on compilation of CCTM</b></li><li>• <b>Still need to compile SMOKE and MEGAN</b></li></ul>

# TASKS CARRIED FORWARD FROM 2022

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

# TASKS CARRIED FORWARD FROM 2022

<b>FY 2023 Task</b>	<b>Comments</b>
4. <b>Extend the AIRPACT forecast period</b> from 48 h (2 days) to 72 h (3 days), in <b>AIRPACT5</b>	<ul style="list-style-type: none"><li>• Amin has completed the scripting for the 3rd day of AIRPACT5 forecasts</li><li>• <b>Currently in testing</b></li><li>• <b>Anticipate full deployment later this summer</b></li></ul>

# TASKS CARRIED FORWARD FROM 2022

<b>FY 2023 Task</b>	<b>Comments</b>
<p>5. <b>Continued improvement of Machine Learning forecast</b> system for ozone and PM2.5.</p>	<ul style="list-style-type: none"><li>• LAR continues to run a new version along side original model</li><li>• Training datasets were recently updated in new model (2017-2022)</li><li>• PurpleAir data over AIRPACT domain have been downloaded for 2017-2022.<ul style="list-style-type: none"><li>• Interpolation will be implemented into LAR's version</li></ul></li><li>• This model framework is being integrated with WA Ecology's code; see below</li></ul>

# TASKS CARRIED FORWARD FROM 2022

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

# New FY23 Tasks

# NEW 2023 TASKS

FY 2023 Task	Comments
<p>Collaborate with Ecology to develop internal website to extend long-term 3- to 5-day ensemble forecasts that cover WA, ID and OR.</p>	<ul style="list-style-type: none"><li>• Created an Ubuntu 22.04 container with Python and R</li><li>• LAR Python code and Ranil's R code and shape files are stored on container</li><li>• ToDo<ul style="list-style-type: none"><li>• Integrate R code with Python model</li><li>• Create WSU website</li><li>• Create GIS files</li></ul></li></ul>

# NEW 2023 TASKS

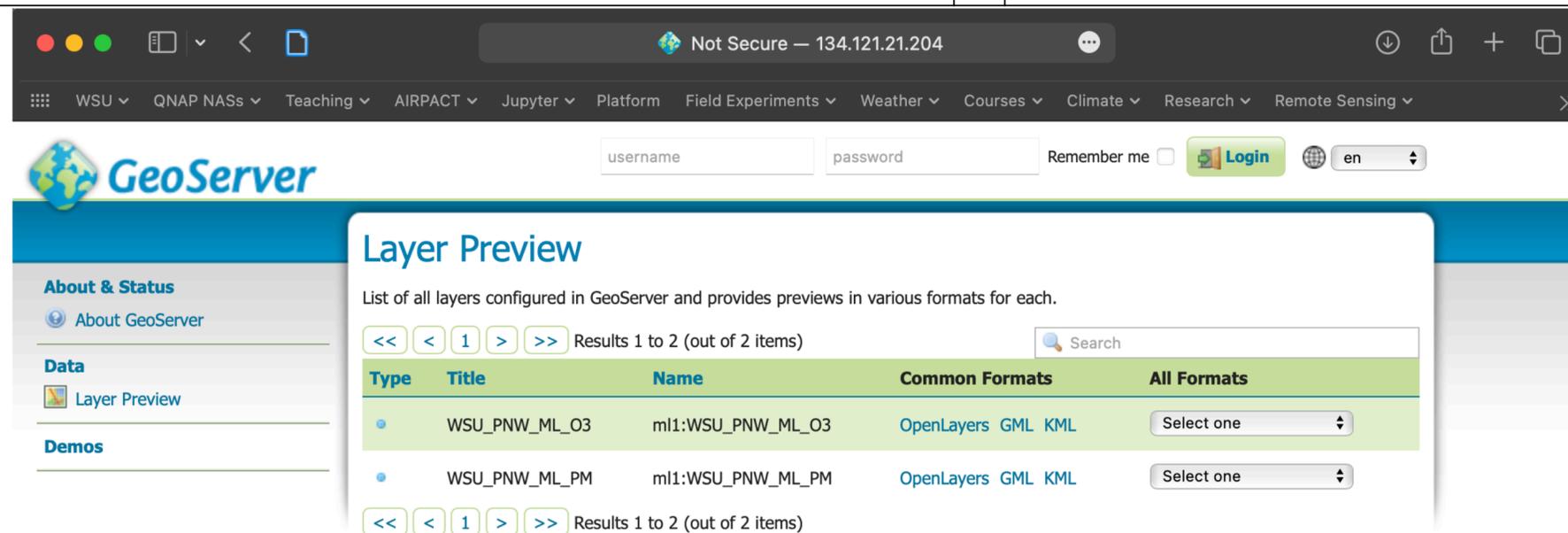
FY 2023 Task	Comments
Include Canadian fires (BC, AB, SK) into BlueSky Pipeline	<ul style="list-style-type: none"><li>• Thanks for Farren Thorpe for help!</li><li>• This has been successfully implemented into the new AIRPACT6 container</li><li>• This has been implemented on a separate Linux workstation</li><li>• Plan is to copy daily results to Aeolus for current AIRPACT5 runs</li><li>• All ready for AIRPACT6</li></ul>

# NEW 2023 TASKS

<b>FY 2023 Task</b>	<b>Comments</b>
Upgrade of AIRPACT website	<ul style="list-style-type: none"><li>• Now available at <a href="https://airpact.wsu.edu">https://airpact.wsu.edu</a></li><li>• New LAR website is also available at <a href="https://lar.wsu.edu">https://lar.wsu.edu</a></li></ul>

# NEW 2023 TASKS (funded by USDA project)

FY 2023 Task	Comments
Availability of LAR forecasting products (AIRPACT5, ML) via GIS server	<ul style="list-style-type: none"><li>• GeoServer has been created internally at LAR</li><li>• Currently testing various GIS products (shapefiles, netCDF files)</li><li>• Deployment in summer 2023</li></ul>



The screenshot shows the GeoServer web interface. At the top, there is a navigation menu with items like WSU, QNAP NASs, Teaching, AIRPACT, Jupyter, Platform, Field Experiments, Weather, Courses, Climate, Research, and Remote Sensing. Below the menu is a login section with fields for 'username' and 'password', a 'Remember me' checkbox, and a 'Login' button. The main content area is titled 'Layer Preview' and contains a table of layers. The table has columns for 'Type', 'Title', 'Name', 'Common Formats', and 'All Formats'. Two layers are listed: 'WSU\_PNW\_ML\_O3' and 'WSU\_PNW\_ML\_PM'. Each layer has a preview in various formats (OpenLayers, GML, KML) and a dropdown menu for 'All Formats'.

Type	Title	Name	Common Formats	All Formats
•	WSU_PNW_ML_O3	m11:WSU_PNW_ML_O3	OpenLayers GML KML	Select one
•	WSU_PNW_ML_PM	m11:WSU_PNW_ML_PM	OpenLayers GML KML	Select one

# FY24 Workplan

# 2024 TASKS

<b>FY 2024 Task</b>	<b>Estimated Date</b>
Update to 2020 EPA National Emissions Inventory (NEI) as data become available.	June 2024

# 2024 TASKS

<b>FY 2024 Task</b>	<b>Estimated Date</b>
Incorporate updated Background Concentrations as data become available.	June 2024

# 2024 TASKS

<b>FY 2024 Task</b>	<b>Estimated Date</b>
Investigate the possibility of building an AIRPACT container that could run a sub- domain at finer spatial resolution (as requested by consortium members).	June 2024

**Thank You!!**

Questions?