# NW-AIRQUEST Project Status Report
## Progress by WSU Lab for Atmospheric Research

NW-AIRQUEST ANNUAL Meeting

3 February 2022

Presented by Von P. Walden for LAR/CEE/VCEA/WSU

# LAR Personnel

| AIRPACT And Machine Learning Modeling | | **META TASK: STAFFING AT LAR** |
|---|---|---|
| | | Amin Vahidi, LAR postdoc, AIRPACT Ops, AIRPACT6 development, ML (Start date at WSU: 1 March 2022 ! ) |
| | | Ana Carla Fernandez-Valdes, PhD student, ML Modeling, USDA Smoke Taint project |
| | | Von Walden, Professor |
| | | Joe Vaughan, Consultant |
| | | Mahshid Etesamifard, completed PhD in Dec 2021, CMAQ for Ports & Boise Projects; Now at Jacobs Engineering (Congrats, Mahshid!) |

# BUDGET STATUS

Budget as of 2 February 2022 (in Year 2 of biennial budget)

Ledger Account/Summary    Period    Amendments

Turn off the new tables view 🔵

Ledger Account/Summary  6 items

| Ledger Account/Summary | Original Amount | Amendment Amount | Current Amount |
|---|---|---|---|
| Chart of Accounts: 00 Salaries and Wages | 68,979.00 | 62,908.00 | 131,887.00 |
| Chart of Accounts: 03 Goods and Services | 10,000.00 | 6,809.00 | 16,809.00 |
| Chart of Accounts: 04 Travel | 2,405.00 | 0.00 | 2,405.00 |
| Chart of Accounts: 06 Equipment | 10,000.00 | 10,000.00 | 20,000.00 |
| Chart of Accounts: 07 Benefits | 16,830.00 | 29,907.00 | 46,737.00 |
| Chart of Accounts: 13 Facilities and Administration | 11,786.00 | 10,376.00 | 22,162.00 |
| Total: | 120,000.00 | 120,000.00 | 240,000.00 |

- Underspent due to Amin's late arrival.
- However, using extra funds to update AIRPACT website to Wordpress

# BUDGET STATUS

Plan to spend remaining funds from Year 2 of biennial budget)

Budget Update for NW-AIRQUEST on 2 February 2022

| | |
|---|---|
| **Balance on 2 February 2022** | $131,887.00 |
| | |
| **Ana Carla** | $15347.60 |
| **Amin** | $26940.00 |
| **Von** | $12304.23 |
| **AIRPACT website (Jen Hinds)** | $15000.00 |
| | |
| **Equipment** | $26000.00 |
| **F&A** | $36187.75 |
| | |
| **Remaining at 30 June 2022** | $107.42 |

# META TASKS

| | Status February 2022 |
|---|---|
| Cluster upgrades | New Motley cluster is being built. (update to Centos 8, NVIDIA compiler)<br><br>Aeolus remains a VCEA HPC resource that runs AIRPACT5 nightly.<br><br>Technical and User Support remains a challenging college issue. |

# Ongoing Tasks

# ONGOING TASKS

| Task | Status February 2022 | |
|---|---|---|
| 1. Provide daily forecasts of air quality for the three state region that can be used in daily AQ management. | DAY-ONE runs for Oct 2021 thru January 2022: (Success rate: 100%) DAY-TWO runs for Oct 2021 thru Jan 2022: (Success rate: 100%) (Had issue with year change (from 2021 to 2022) with the ML model; fixed (for future years) | |
| | | |

# ONGOING TASKS

| Task | Status February 2022 | |
|---|---|---|
| 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. Filled data requests: Rong Li (Idaho DEQ) requested rolling 8-hour ozone data from AIRPACT5 for Pocatello and Idaho Falls for 2021 | |
| | | |

# ONGOING TASKS

| Task | Status February 2022 | |
|---|---|---|
| 3. Track and continue to improve model performance so that model predictions provide useful guidance for air quality forecasting. | Ongoing. | |
| | | |

# ONGOING TASKS

| Task | Status February 2022 | |
|------|---------------------|---|
| 4. Maintain ambient air monitoring data streams from AIRNow. | Ongoing. | |
| 5. Maintain satellite retrievals that are still functioning (except for MODIS and OMI). | Ongoing. | |
| 6. Continue improvements and requested additions to web graphical display. | "visual range" (VR) was added | |
| | | |

# ONGOING TASKS

| Task | Status February 2022 | |
|---|---|---|
| 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 February 2022 | |
|------|---------------------|---|
| 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. | Addressed in AIRPACT6

Hosted by IDEQ:

http://lar.wsu.edu/nw-airquest/lookup.html has link | |
| | | |

# ONGOING TASKS

| Task | Status February 2022 | |
|------|---------------------|---|
| 11. Modeling infrastructure maintenance and updates. | Von Walden is now chair of the VCEA HPC committee; quarterly meetings (Status of aeolus and motley) | |
| | | |

# Carry-over Tasks

# TASKS CARRIED FORWARD TO 2021-2022

| SFY 2021 Task | | Comments |
|---|---|---|
| 1. Create updated AIRPACT6 forecasting framework to accommodate changes in computation platform and implement component updates/upgrades | | While waiting for motley to become available, a Linux VM was created at Microsoft Azure. Following software has been installed:<br>• Linux Centos 8.2 (planned for motley)<br>• NetCDF C library<br>• IO API 3.2<br>• SMOKE 4.81<br>• CMAQ 5.3.2<br>(Now waiting for Amin's arrival !!) |

# TASKS CARRIED FORWARD TO 2021-2022

| SFY 2021 Task | | Comments |
|---|---|---|
| 2. Update biogenics to MEGAN v3 in AIRPACT6 (possibly with HPC parallelization)<br><br>3. Switch to running with updated emissions and SMOKE 4.5, in AIRPACT6.<br><br>4. Extend the AIRPACT forecast period from 48 h (2 days) to 72 h (3 days), in AIRPACT6. | | All of these tasks are pending progress on building AIRPACT6 on new HPC<br><br>However, we will attempt to update these on the Azure VM |
| | | |

# TASKS CARRIED FORWARD TO 2021-2022

| SFY 2021 Task | | Comments |
|---|---|---|
| 5. Implement the Simple Air Quality Model (PSCAA) for PM2.5 in Tacoma, in AIRPACT6. | | No progress since October meeting. |

# TASKS CARRIED FORWARD TO 2021-2022

| SFY 2021 Task | | Comments |
|---|---|---|
| 6. Interpolate ML forecasts for ozone and PM2.5 to provide domain-wide forecasts, in AIRPACT6. | | Ana Carla added more robust error-checking to Kai Fan's ML model; LAR is currently running a version along side Kai's version<br><br>Interpolation will be implemented into LAR's version of the ML model |
| | | |

# TASKS CARRIED FORWARD TO 2021-2022

| SFY 2021 Task | | Comments |
|---|---|---|
| 7. Incorporate existing sensor networks (Urbanova, Purple Air, etc.) into ML forecasting system, in AIRPACT6. | | No progress since October meeting. |
| | | |

# TASKS CARRIED FORWARD TO 2021-2022

| SFY 2021 Task | Comments |
|---|---|
| 8. Case studies for ozone and PM2.5 for events using new AIRPACT6 system (rerunning previous events for evaluation and study). | Work will begin after the completion of AIRPACT6. |
| | |

# TASKS CARRIED FORWARD TO 2021-2022

| SFY 2021 Task | Comments |
|---|---|
| 9. Experimental drone flights of opportunity to study wintertime inversion conditions (e.g., Pinehurst, ID). | Work on hold due to Covid-19 pandemic. |
| | |

# New 2022 Tasks

# NEW 2022 TASKS

| SFY 2022 Task | Comments |
|---|---|
| Migration of AIRPACT scripts and code to GitHub repository | Completed.<br><br>AIRPACT Operations (public)<br>https://github.com/wsular/airpact<br><br>AIRPACT6 Development (private)<br>https://github.com/wsular/airpact6<br><br>ML Model Development (private)<br>https://github.com/wsular/aq-ml-model-kai_fan |
| | |

# NEW 2022 TASKS

| SFY 2022 Task | Comments |
|---|---|
| Collaborate with Ecology to develop internal website to extend long-term 3- to 5-day ensemble forecasts, to cover ID and OR. | No progress since October meeting. |

# NEW 2022 TASKS

| SFY 2022 Task | Comments |
|---|---|
| Further development of AIRPACT Forecast Modeling System | <ul><li>"Containerize" AIRPACT6 for potential remote deployment</li><li>Use VM to emulate aeolus' OS to test new scripting</li><li>Test use of cloud storage for long-term AIRPACT data archival</li></ul> |

# Thank you!