Praful Dodda

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Education

University of North Carolina at Chapel Hill, Gillings School of Global Public Health — **Chapel Hill, NC**

Ph.D. in Environmental Sciences and Engineering (June 2026) — 2026

National Institute of Technology — **Warangal, India**

M.Tech. in Environmental Engineering — 2019

Gayatri Vidya Parishad College of Engineering — **Visakhapatnam, India**

B.Tech. in Civil Engineering — 2017

Research Interests

Global ozone; atmospheric chemistry and air quality modeling; geostatistical and Bayesian data fusion; satellite data retrievals; machine learning for atmospheric composition; global exposure and disease-burden assessment.

Research Experience

UNC Chapel Hill, Gillings School of Global Public Health — **Chapel Hill, NC**

Graduate Research Assistant with Prof. Marc L. Serre — **2026**

Dissertation: Evaluation of Geostatistical Data Fusion Methods to Improve Spatiotemporal Estimates of Air Pollutant Concentrations.

Managed deliverables and timelines across multiple research projects funded by the NIH, NASA, EPA, and FAA.

Global Ground-Level Ozone Estimation (Satellite × Model × Observations)

- Developed a Bayesian Maximum Entropy (BME) data-fusion framework that integrates bias-corrected satellite retrievals with chemical-transport-model output and ground observations to produce global ground-level ozone estimates.
- Bias-corrected multi-source atmospheric datasets across differing spatial and temporal resolutions to generate consistent global surface-ozone fields.

Bayesian Maximum Entropy (BME) Data Fusion (Regional Air Quality)

- Built a BME data-fusion framework generating high-resolution daily air-quality surfaces, enabling large-scale epidemiological studies of health effects and exposure disparities in the US Gulf States.
- Collaborated with epidemiological teams to define data needs and deliver customized pollutant datasets for health studies.

Machine Learning-Based Air Quality Forecasting

- Developed and trained predictive machine-learning models to forecast daily ground-level $PM_{2.5}$ and NO_2 concentrations at global scale using satellite and reanalysis inputs.
- Placed in the top 2% (Rank 12 of 664 teams) of the 2023 NASA/DrivenData Air Quality Forecasting Challenge for forecasting NO2 from satellite data.

Dispersion and Chemical Modeling

- Enhanced AERMOD by integrating a novel chemical mechanism to better simulate O_3, NO_2, and secondary $PM_{2.5}$.

- Created an emissions-processing pipeline using the Aviation Environmental Design Tool (AEDT) and SQL to compile detailed daily emission inventories for multiple airports, providing key inputs for dispersion modeling.

State and Regional Air Policy Analysis

- Quantified cross-state air-pollution impacts by modeling five policy scenarios with CMAQ-DDM, processing and analyzing over 20 TB of model output.

Low-Cost Sensor Network Validation and Calibration

- Developed a machine-learning calibration model for low-cost $PM_{2.5}$ sensors that improved accuracy by >40% versus traditional regression, increasing the reliability of community-led monitoring networks.

National Institute of Technology, Warangal, Dept. of Civil Engineering **Warangal, India**

Graduate Research Assistant with Prof. M. Chandra Sekhar **2019**

Thesis: Numerical Simulation and Validation of Regional Air Quality in Eastern India using WRF-Chem.

Teaching & Mentoring

- Developed the **Modern Bayesian Maximum Entropy Graphical User Interface (MBMEGUI)**, an instructional software tool used to teach advanced geostatistical data-fusion methods to graduate students at UNC-Chapel Hill.
- Collaborated with interdisciplinary epidemiology teams, translating atmospheric-science methods into datasets and guidance for non-specialist researchers.

Technical Skills

- **Atmospheric & Chemical Transport Models:** CMAQ, CMAQ-DDM, WRF-Chem, WRF, AERMOD
- **Emissions Processing:** SMOKE, Aviation Environmental Design Tool (AEDT)
- **Machine Learning:** scikit-learn, TensorFlow, Keras, PyTorch
- **Programming:** Python, R, MATLAB, C, Fortran, Bash, HTML
- **Geospatial & Data Analysis:** ArcGIS, QGIS, GeoPandas, xarray, rasterio, Shapely
- **Atmospheric Data Formats:** NetCDF, HDF5, GRIB, GeoTIFF
- **High-Performance & Cloud Computing:** Linux clusters, Slurm, AWS

Certifications

- AWS Certified Solutions Architect - Associate (SAA-C03), Amazon Web Services.

Publications

1 published, 2 in review, 5 in preparation (3 on data fusion, 2 on exposure assessment).

Published

Abbott, N. A.; Semone, L.; Strott, R.; **Dodda, P.**; Wang, C.-T.; Green, J.; Baek, B. H.; Engel, L. S.; Vizuete, W.; Serre, M. L. Evaluation of Bayesian Maximum Entropy Data Fusion Approaches to Estimate Styrene, Benzene, Toluene, Ethylbenzene, and Xylenes and to Inform Epidemiological Analyses in the US Gulf States. *Environ. Sci. Technol.* 2025, 59 (1), 45–55.

In Review

Dodda, P.; Abbott, N. A.; Semone, L.; Strott, R.; Wang, C.-T. Norris, L. C; Martin. T. A; Engel, L. S.; Baek, B. H.; Vizuete, W.; Serre, M.L. Bayesian Maximum Entropy Data Fusion for Population Exposure Assessment and Trend Analysis of Styrene, Benzene, , Toluene, Ethylbenzene, and Xylenes (SBTEX) in the US Gulf States During 2011-2016. (in review at ES&T).

Dodda, P.; Abbott, N. A.; Wang, C.-T.; Norris, L. C; Martin. T. A; Engel. S. L; Baek, B.H; Vizuete. W; Serre. M. L. Calculating Population Weighted Exposure to Volatile Organic Compounds for Population Subgroups in the U.S. Gulf States in 2011-2016 using High Resolution Maximum Entropy Data Fusion Estimates (in review at ES&T).**In Preparation**

Dodda, P.; Wang, H.; Chang. K.L; Heidkamp, G.; West, J.; Serre, M. L. Estimating Monthly Global Surface Ozone using Bayesian Maximum Entropy Data Fusion of Observations, Chemical Transport Models, and Satellite Retrievals.

Four additional manuscripts in preparation (two on data fusion and two on exposure assessment).

Conference Presentations

Serre, M. L.; Abbott, N.; Wang, C.-T.; **Dodda, P.**; Strott, R.; Semone, L.; Baek, B.; Vizuete, W.; Engel, L. Model Performance Evaluation of Space/Time Bayesian Maximum Entropy Data Fusion of Styrene, BTEX and Criteria Air Pollutants in the Gulf Region from 2011–2012 and Implications for Assessing Exposure Inequities. *AGU Fall Meeting*, 2024, GC41A-04.

Honors & Awards

- Sherry D. Milan Environmental Justice Scholarship, UNC-Chapel Hill.
- Top 2% finish (Rank 12 of 664 teams), 2023 NASA/DrivenData Air Quality Forecasting Challenge.
- Second-highest academic standing in the M.Tech. cohort, National Institute of Technology, Warangal.