TOAR-II

Specifically, the goals of TOAR-II are:

1. TOAR Ozone Data Portal: Update the ozone observations in the TOAR surface ozone database to include all recent observations (since 2014), and include data from new sites and regions, as well as ozone precursor and meteorological data. Develop methods for including historical data (pre-1975) and create working links to repositories of free tropospheric observations.

2. TOAR publications: Exploit the new observational datasets collected by Goal 1 (with data through 2020) to provide an updated state of the science estimate of ozone's global distribution and trends relevant to climate, human health and vegetation. Extend the statistical toolbox and metrics of the TOAR trend analyses. These results will be published in the open-access, peer-reviewed literature.

3. Involve scientists from the atmospheric sciences community, as well as statisticians and scientists who focus on broader issues of global change and sustainability, to identify outstanding science questions in relation to tropospheric ozone. The range of topics can be expanded beyond the scope of the original TOAR effort to investigate the impacts of tropospheric ozone on climate, human health and vegetation, and to address urban-scale issues in addition to the regional and global scale.

4. Maximize exploitation of the TOAR Surface Ozone Database by, 1) helping scientists around the world, beyond the TOAR effort, to apply the database to new analyses, and 2) exploring new data science methods to improve the analysis of global ozone trends and their attribution.

TOAR Focus Working Groups

Current Working Groups

[Chemical Reanalysis Focus Working Group](#)

[East Asia Focus Working Group](#)

[Global and Regional Models Focus Working Group](#)

[HEGIFTOM Focus Working Group](#)

[Human Health Impacts of Ozone Focus Working Group](#)

[Machine Learning for Tropospheric Ozone](#)

[Ozone Deposition Focus Working Group](#)

[Ozone over the Oceans Focus Working Group](#)

[Ozone and Precursors in the Tropics (OPT) Focus Working Group](#)

[Radiative Forcing Focus Working Group](#)

[ROSTEES Focus Working Group](#)

[Satellite Ozone Focus Working Group](#)

[South Asia Focus Working Group](#)

[Statistics Focus Working Group](#)

[Tropospheric Ozone Precursors (TOP) Focus Working Group](#)

[Urban Ozone Focus Working Group](#)

TOAR-II

The TOAR-II Community Special Issue will be an inter-journal special issue hosted by six Copernicus open-access, peer-reviewed journals (ACP [lead journal], ESSD, AMT, GMD, ASCMO and BG).

The submission window is March 1, 2023 –April 30, 2024, and manuscripts may be submitted to any of the six participating journals.

Submissions are open to all and participation with TOAR-II is not required; the only requirements are:

1) the submitted paper must address some aspect of tropospheric ozone and it must conform to the journal's submission guidelines;

2) the authors must inform Owen Cooper (TOAR Scientific Coordinator of the Community Special Issue; owen.r.cooper@noaa.gov) of the manuscript submission; and

3) as TOAR papers and the Copernicus journals focus on science and not policy, the submitted paper may be policy-relevant, but not policy-prescriptive.

ML4O3 Focus Working Group

Within this working group (WG), we will focus on knowledge that can be derived from the TOAR database, in conjunction with other data, to shed light on existing scientific problems and questions.

Ozone formation and loss processes are highly nonlinear and heavily depend on other chemical variables and meteorological properties.

Air pollutant concentrations are controlled by four main types of processes: emissions, transport, (chemical and physical) transformations, and loss processes such as deposition and washout.

These processes that affect production and removal of ozone are of a complexity where high-quality interpolation, forecasting, and quality assurance would benefit from ML approaches.

This WG will bring together ozone and machine learning experts, allowing us to develop best practice guidelines on data preprocessing and model evaluation with respect to AI applications.

ML4O3 Focus Working Group

Key objectives of the WG include:

1. The interpolation of missing values in the TOAR database in two ways: (a) derive reliable information on air quality at stations where incomplete or no measurements exist (spatial interpolation to "new" or "unknown" station locations; (b) fill temporal gaps in the measurement time series at individual station locations by identifying a transfer function

2. The detection of potentially "suspicious" or "wrong" values in the ingestion phase of the TOAR database

3. Detection of ozone regimes, e.g. high photochemical production vs transport dominated areas (classification task), based on station proxy or meteorological data.

4. Transfer properties of regional ML-models to a global scale and demonstrate how well this approach is suited for tropospheric ozone. What areas show good/bad performances, and can we identify (chemical/physical) causes related to the performance?

5. Documenting and developing best practices for handling TOAR data for use with machine learning applications