SHADOZ Notes
Southern Hemisphere ADditional OZonesonades

A NASA/Goddard Space Flight Center public archive of tropical and remote ozonesonde profile data

SHADOZ is a NASA project to augment and archive balloon-borne ozonesonde launches and to archive data from tropical and remote operational sites. The project was initiated in 1998 by NASA/Goddard Space Flight Center, the NOAA/Global Monitoring Division, and international co-investigators. There are currently thirteen stations launching ozonesondes in the SHADOZ network. The collective data set provides the first climatology of tropical ozone in the equatorial region, enhances validation studies aimed at improving satellite remote sensing techniques for tropical ozone estimations, and serves as an educational tool to students, especially in participating countries.

❖ NASA GSFC HOSTS REGIONAL STATION VIRTUAL MEET-UPS ❖

The COVID-19 pandemic has restricted travel for site visits, conferences, and technical meetings in 2020 and so far in 2021. To help facilitate communications with SHADOZ stations during this period, the NASA GSFC SHADOZ team organized and hosted Regional Station Virtual Meet-Ups March-May 2021 with three regions so far: Southeast Asia, Equatorial Americas and the NOAA Pacific stations (Screenshots of attendees in Figure below). Attendees for each Meet-Up numbered 16, 15 and 13 respectively including the GSFC team (Anne Thompson, Ryan Stauffer and Debra Kollonige), NOAA/GML partners (Bryan Johnson and Patrick Cullis pictured below), station PIs, field operators and data managers. Individual stations presented updates on their current staff, ozonesonde launch operations and future plans (e.g. participation in the upcoming Quadrennial Ozone Symposium). The GSFC team shared updates on new ozonesonde standards, data quality assurance and the importance of metadata for data processing.

Figure: Screenshots of: (left) Meet-Up #1 attendees for Southeast Asia stations. (middle) Meet-Up #2 attendees for Equatorial Americas stations and (right) Meet-Up #3 attendees for the NOAA Pacific stations.

Newsletter Editor: Debra E. Kollonige (debra.e.kollonige@nasa.gov)
Dear SHADOZ Colleagues,

The purpose of this note is twofold: (1) to thank all the SHADOZ operators, data providers and sponsors who have kept data flowing during the pandemic and (2) to reflect on SHADOZ highlights over the past 23 years as I transition from SHADOZ Principal Investigator (PI) to SHADOZ “Founding PI.” There are still restrictions in SHADOZ host countries but thanks to dedication of operators and their organizations, all but 2 stations are launching 15 months after “work from home” orders began. This is an extraordinary achievement – thank you! Year after year, the station people make SHADOZ the “premier ozonesonde network” as our Archiver of 20 years (Sept. 1998–April 2019), Jacquie Witte, liked to call us.

What began as a 3-year funded proposal in 1997 with NOAA’s Global Monitoring Lab and partners from 5 continents representing 10 stations (see logo), has grown to 14 stations with more than a decade of ozonesonde-radiosonde profiles – 9000 pairs at https://tropo.gsfc.nasa.gov/shadoz. Indeed, there are years when SHADOZ profiles have accounted for 15-20% of the WUDC record. SHADOZ has >2000 citations and the data are now used in countless papers assimilated in models and with satellite data. SHADOZ has had tremendous impact on tropical atmospheric science and beyond. Among other highlights and spinoffs of SHADOZ are:

1) Filling in ozone structure in the upper troposphere and lower stratosphere in the tropics led to the discovery of a distinct “tropical tropopause layer” that is neither simply stratospheric nor tropospheric in nature. **SHADOZ has an h-index of 26 with an average of 109 citations per year for 1998-2021.**


3) From 2000 and beyond, the participation of SHADOZ in quality assurance activities has been highly visible and effective. SHADOZ was active in the 2000 Jülich Ozone Intercomparison Experiment (JOSIE) and the PI and Archiver joined the Assessment of Ozone Intercomparison Standard Operating Procedures (ASOPOS) expert team when it formed in 2004. The first WMO/Global Atmospheric Watch (GAW) Report was based on JOSIE-2000 and the ASOPOS activities. **The 2017 JOSIE experiments were dedicated to SHADOZ, with all test profiles simulating tropical conditions (Thompson et al., BAMS, 2019).** Eight SHADOZ station personnel participated in a major capacity-building exercise.

4) The capstone project of the JOSIE series is the 2021 ASOPOS 2.0 Report, sponsored by WMO/GAW, the Intl Ozone Commission and the Network for the Detection of Atmospheric Composition Change (NDACC). **Anne Thompson is Co-Editor of ASOPOS 2.0 and Ryan Stauffer and Debra Kollonige are Chapter authors.**

5) The “strategic ozonesonde network” concept (Thompson et al., Atmos. Env., 2011) was extended by the SHADOZ team to 4 North American field campaigns when coordinated launches were conducted during US-Canada-Mexico aircraft experiments in the “IONS” (Intensive Ozonesonde Network Study). Collaborators were NOAA/Global Monitoring Laboratory (S. Oltmans and B. Johnson, Boulder) and Environment and Climate Change Canada (D. Tarasick, Downsview).

**At the end of May 2021, I formally retired in a transition from NASA/Goddard Senior Scientist for Atmospheric Chemistry to “Senior Scientist Emeritus.”** I expect to stay active as time allows in international ozonesonde quality assurance work but the day-to-day leadership of SHADOZ and of the NDACC Wallops Island ozone station has transitioned to Dr. Ryan Stauffer. Many of you know Ryan from JOSIE-SHADOZ, sites visits and conferences. Please welcome Ryan as he takes on the Principal Investigator duties. I look forward to seeing many of you at ongoing virtual meetings, and before long, in person again.

Anne Thompson
SHADOZ Founding Principal Investigator
New 2021 Funding for 3 Equatorial Americas Stations

In February, NASA Headquarters funded 3 SHADOZ stations in the Equatorial Americas region beginning in 2021. These stations are Costa Rica through a renewed partnership with Professor Andres Diaz and the University of Costa Rica (UCR); and San Cristóbal in the Galápagos and Quito, Ecuador, through a new arrangement with Professor María Cazorla and the University of San Francisco Quito (USFQ). Costa Rica has been a part of SHADOZ since 2005 and San Cristóbal was an active SHADOZ station until early 2016. During the Equatorial Americas Meet-Up in April, Professor Cazorla shared the history of the newest SHADOZ station, Quito, which has ozonesonde launches dating back to 2014, and her plans for the reactivation of the San Cristóbal station. The SHADOZ PI is currently working with the station PIs on the logistics for launching ozonesondes regularly this year.
❖ SHADOZ at NOAA Global Monitoring Annual Conference ❖

- On May 26, Ryan Stauffer, Anne Thompson, and Debra Kollonige presented on ozonesonde data quality and tropical ozone trends at NOAA’s eGMAC (https://gml.noaa.gov/annualconference/index.html):
  - **Stauffer**, talk: “An Updated Examination of the Post-2013 Ozonesonde Total Column Ozone Dropoff”
  - **Thompson**, talk: “Regional and Seasonal Trends in Tropical Ozone from SHADOZ (So. Hemisphere Additional Ozonesondes) Profiles: Reference for Models and Satellite Products”
  - **Kollonige**, poster: “ASOPOS (Assessment of Standard Operating Procedures (SOPs) for OzoneSondes) 2.0: Ozonesonde Measurement Principles and Best Operational Practices”.

- Other presentations during eGMAC from SHADOZ Colleagues include:
  - **Bryan Johnson** (NOAA/GML), poster: “New ECC Ozonesonde Pump Flow Efficiency Measurements”.
  - **Holger Vömel** (NCAR), poster: “The Importance of the Time Response of Electrochemical Concentration Cell (ECC) Ozonesondes for Measurements of Tropospheric and Stratospheric Ozone”.

❖ Recent noteworthy ozonesonde publications ❖


### Upcoming Relevant Meetings

SHADOZ will be represented at the following:

**19-23 July 2021:**
Ozone Research Managers Meeting

**13-17 September 2021:**
NDACC Steering Committee Meeting
International Global Atmos. Chem. (IGAC) Meeting

**3-9 Oct 2021:**
Quadrennial Ozone Symposium
Seoul, Korea

### Attention Data Users:
- Questions about SHADOZ should be directed to PI, Ryan Stauffer. SHADOZ data sets are products of evolving research by the site Co-Investigators (Co-Is) and ongoing community collaboration.
- The SHADOZ homepage gives technical and contact information for each station and their Co-Is responsible for the original data processing. Co-Is should be consulted for details of their methods & appropriate references to their work.
- Questions about the final data and any news updates should be directed to the Archiver: Debra Kollonige.

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### SHADOZ GSFC Science Team

<table>
<thead>
<tr>
<th>Dr. Ryan M. Stauffer</th>
<th>Dr. Debra E. Kollonige</th>
<th>Dr. Anne M. Thompson</th>
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<tbody>
<tr>
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### SHADOZ Site

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<tr>
<th>SHADOZ Site</th>
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