# First Reprocessing of SHADOZ (Southern Hemisphere ADditional OZonesondes) data records

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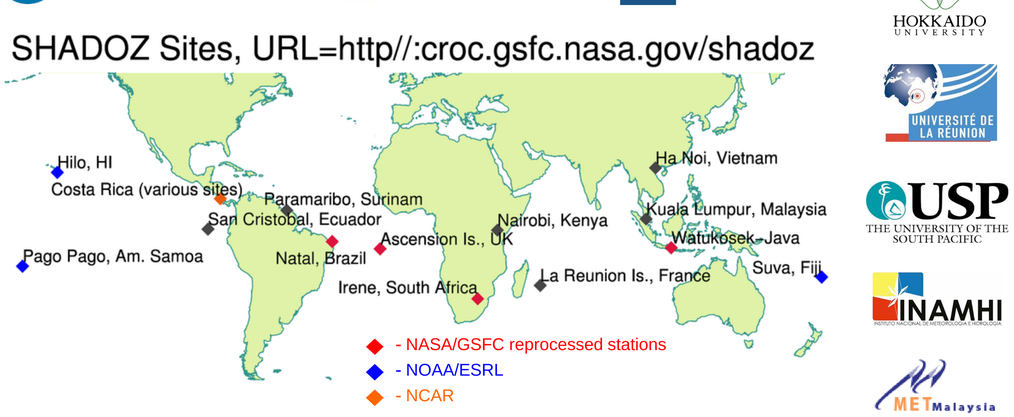



**SHADOZ** is a NASA project in collaboration with US and international partners to archive profile from ozonesondes in tropical environments and remote, value-added locations in the southern hemisphere. Profiles are publicly available at http://croc.gsfc.nasa.gov/shadoz.

### Rationale

- Like many long-term sounding stations, SHADOZ is characterized by variations in operating procedures, launch protocols, and data processing such that biases within a data record and among sites appear.
- Over time, the ozonesonde instrumentation and data processing protocols have changed, adding to the measurement uncertainties at individual stations and limiting the reliability of ozone profile trends and continuous satellite validation.
- Currently, the ozonesonde community is engaged in reprocessing ECC data, with an emphasis on reprocessing long term records to compensate for the variations in instrumentation and technique.

### Goal

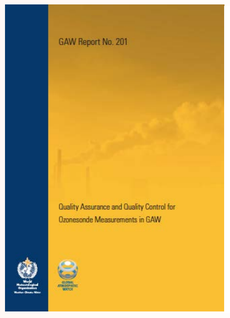
- To improve the information and integrity of each measurement record by correcting known errors based on post-processing guidelines.

## REPROCESSING APPROACH

**Four stations (red diamonds on SHADOZ map) have been reprocessed - Natal, Brazil; Ascension Is., U.K.; Irene S. Africa; and Watukosek-Java, Indonesia - based on:**

- Training hosted by ozonesonde NOAA/ESRL/GMD experts (Bryan Johnson, Chance Sterling, Patrick Cullis, and Allen Jordan) using the SkySonde Post-processing tool developed by Allen Jordan (CIRES@NOAA/ESRL).
- Post-processing guidelines follow: WMO report #201, Quality Assurance and Quality Control for ozonesonde measurements and SI2N/O3S-DQA Activity Homogenization Guidelines

### Primary source materials




O3S-DQA Activity: Guide Lines for Homogenization of Ozone Sonde Data (Version 2.0: 12 October 2012)

**SI2N/O3S-DQA Activity:**

**Guide Lines for Homogenization of Ozone Sonde Data**

**(Version 2.0: 19 November 2012)**

Prepared by

O3S-DQA panel members on homogenization of O3S-data

(Herman Smit, Sam Oltmans, Terry Deshler, David Tarasick, Bryan Johnson, Frank Schmidlin, Rene Stuebi, Jonathan Davies)

Activity as part of

**SPARC-IGACO-IOC Assessment**

**(SI2N)**

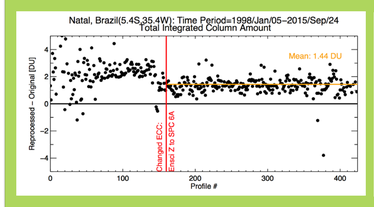
**"Past Changes in the Vertical Distribution of Ozone"**

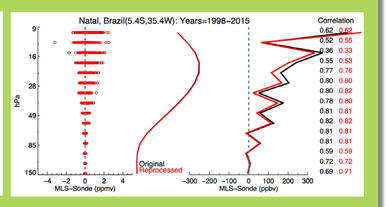
## SUMMARY

Factors contributing to differences between reprocessed and original data records vary station to station. Reprocessing is somewhat limited due to a combination of:

- Unavailable metadata information (for example Lab conditions to calculate the flowrate correction)
- Instrument version (for example RS80 radiosondes dominated the much of our data records and did not contain GPS measurements possible to make pressure offset corrections)
- Incomplete software capabilities in the historic record

## Natal, Brazil

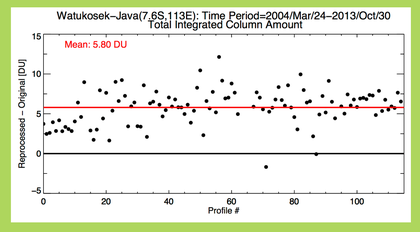


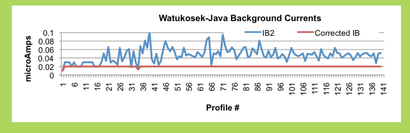

- Large variability and differences between reprocessed and original Natal data records observed prior to 20020731 is due to instrument manufacturer differences, i.e. ENSCI VS SPC. Reprocessing increases ozone in most profiles by 1-2 DU.
- Reprocessed Natal data see small improvements in the maximum ozone region of the stratosphere when compared to MLS.

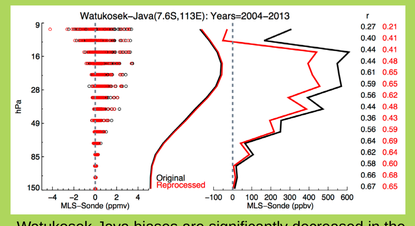
| | ORIGINAL | REPROCESSED |
|---|---|---|
| **Time Period** | 1998 January 05 – 2015 September 24 | |
| **Solution** | 1% Full buffer | |
| **ECC Type** | Mostly SPC6A with a small number of EnSci Z | |
| **Radiosonde Type** | Lockhead Martin Sippican (LMS) | |
| **Pressure offset correction** | No – GPS Altitude not included | |
| **Final Background Current** | IB2 = Background before launch | IB0 = Prior to high ozone conditioning. Capped at the 25th percentile of IB = 0.013 mA |
| **Pump Correction Factors** | Wallops Lab average based on early Bell Jar experiments | WMO recommended: Komhyr, 1995 constants for EnSci Z and Komhyr, 1986 constants for SPC 6A |
| **Flowrate Correction** | No | |

## Watukosek-Java, Indonesia




- Watukosek-Java is the only station in current reprocessing stream that uses 2% unbuffered KI solution.
- Large differences (~5.8 DU) are emphasizing the importance of using the correct pump efficiency factors and appropriate background currents (plot below).




Watukosek-Java biases are significantly decreased in the maximum ozone region when compared to MLS.

| | ORIGINAL | REPROCESSED |
|---|---|---|
| **Time Period** | 2004 March 24– 2013 October 30 | |
| **Solution** | 2% Unbuffered – NOAA Specific formula | |
| **ECC Type** | Mostly Ensci 2Z with a handful ofr SPC 6A | |
| **Radiosonde Type** | Vaisala RS80 | |
| **Pressure offset correction** | No | |
| **Final Background Current** | IB2 = Background before launch | IB0 = Prior to high ozone conditioning. Capped at the 25th percentile of IB = 0.02 mA |
| **Pump Correction Factors** | Komhyr, 1995 | NOAA Lab determined for Ensci 2Z and 2% unbuffered solution |
| **Flowrate Correction** | Yes | |

## WHAT'S NEXT …

Reprocessing activities continues with the following stations:

- Hanoi, Vietnam
- Kuala Lumpur, Malaysia
- La Reunion Is.
- San Cristóbal, Galapagos, Ecuador (to be completed by NOAA/GMD Group)

- The homogenization phase will apply transfer functions developed by the Assessment of Standard Operating Procedures for Ozonesondes (ASOPOS) panel to account for differences between manufacturer and solution types.

## ACKNOWLEDGEMENTS

Support for SHADOZ comes from NASA's Aura Validation and Upper Atmospheric Research Program (UARP; Dr. K. W. Jucks) in partnership with NOAA/ESRL/Global Monitoring Division and international partners.