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COMPARISON OF TROPOMI TOTAL OZONE COLUMN WITH GROUND-BASED MEASUREMENT IN RÍO GALLEGOS, ARGENTINA

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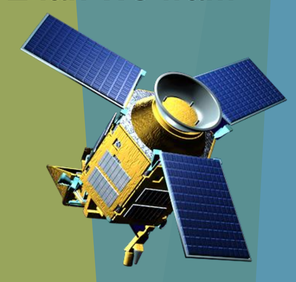

INTRODUCTION

In this study, the TROPOspheric Monitoring Instrument (TROPOMI) Offline total ozone column (TOC) product is compared with ground-based observations made by SAOZ instruments for the period 2018–2024.

TROPOMI instrument is on board the ESA Copernicus Sentinel-5 Precursor satellite launched in October 2017. It provides a daily global coverage at a spatial resolution as high as 7 km × 3.5 km (Lambert *et al*., 2019).

The SAOZ instrument, which belongs to LATMOS/CNRS (Laboratoire Atmosphères, Milieux, Observations Spatiales/Centre National de la Recherche Scientifique), is installed in the Observatorio Atmosférico de la Patagonia Austral [Atmospheric Observatory of Southern Patagonia] (OAPA) (CITEDEF (UNIDEF–CONICET)) in Río Gallegos, Argentina (51.60°S, 69.30°W; 72 m a.s.l.) since 2008 (Orte *et al*., 2019). It performs zenith measurements of the spectral diffuse solar irradiance at sunrise and sunset (at SZA between 86° and 91°).

OAPA SITE AND ITS IMPORTANCE

Surface monitoring of TOC in southern Patagonia is crucial as it constitute the southernmost continental regions of the world (excluding Antarctica) and the closest to the Antarctic polar vortex. The lack of ground-based observations along the Southern subpolar-mid latitudes (between 39°S and 63°S, Figures 1) highlights their importance for analyzing the impact of the ozone hole influence and satellite validation in these latitudes.

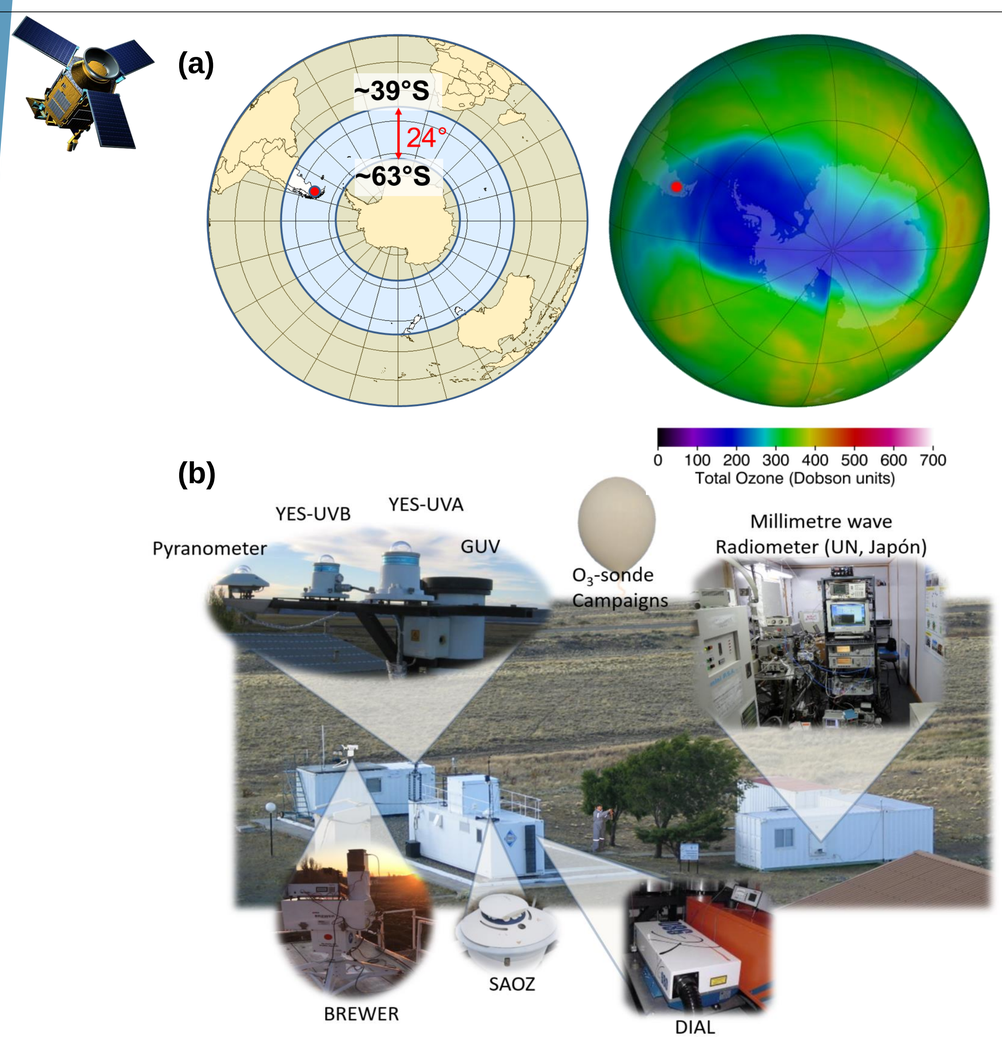

Figure 1. (a) Location of OAPA (red point), highlighting the lack of continental área between 39 and 63°S (left) together with an example of ozone hole influence over Patagonia on November 13, 2014 (right) (https://ozonewatch.gsfc.nasa.gov). (b) OAPA – O3 and Solar radiation Ground-based observations.

Table 1. Instrumental capability installed in OAPA. Instruments and parameters retrieved.

Instrument	Parameter	Institution	Period
SAOZ	TOC, NO_2	LATMOS/OAPA	2008 – today
Brewer MKIII	TOC, UV spect., O_3 profile, SO_2	CITEDEF/OAPA	2015 – today
DIAL	O_3 profile	CITEDEF/OAPA	2005-2017 (AOH season)
MWR	O_3 profile	Nag. Univ./OAPA	2012-today (with missing data)
O3-sonde	O_3 profile	CITEDEF/OAPA	Campaigns (AOH season)
UV broad band	UV Irradiance	SMN/CITEDEF	Depending on the site
UV narrow band (GUV)	UV Irradiance	SMN/CITEDEF	Depending on the site
Pyranometer	Global Horizontal Irradiance	SMN/CITEDEF	

METHODOLOGY

The SAOZ spectrometer has been in operation at OAPA, Río Gallegos, since March 11, 2008. In 2009, it was incorporated to the NDACC (Network for the Detection of Atmospheric Composition). It performs spectral diffuse solar irradiance measurements at zenith twice a day (at sunrise and sunset), for solar zenith angles (SZA) between 86° and 91°. On the other hand, TROPOMI provide one or two TOC measurements at Río Gallegos latitude depending on the orbit. The daily mean of the TOC for satellite and ground-based measurement were retrieved for the comparison.

The correspondence between the daily mean of the TOC from TROPOMI and SAOZ was evaluated by means of a linear regression analysis. The correlation coefficient (R) and the relative root mean squared error (rRMSE) were analyzed.

RESULTS

The comparison was performed through a linear regression analysis of the daily mean TCO from satellite and ground-based observations (Figure 2). It presents a close behavior to the x=y line, with an slope value close to one and an intercept of 6.24. It showed correlation values of 0.95 and a relative RMSE of 3.63%.

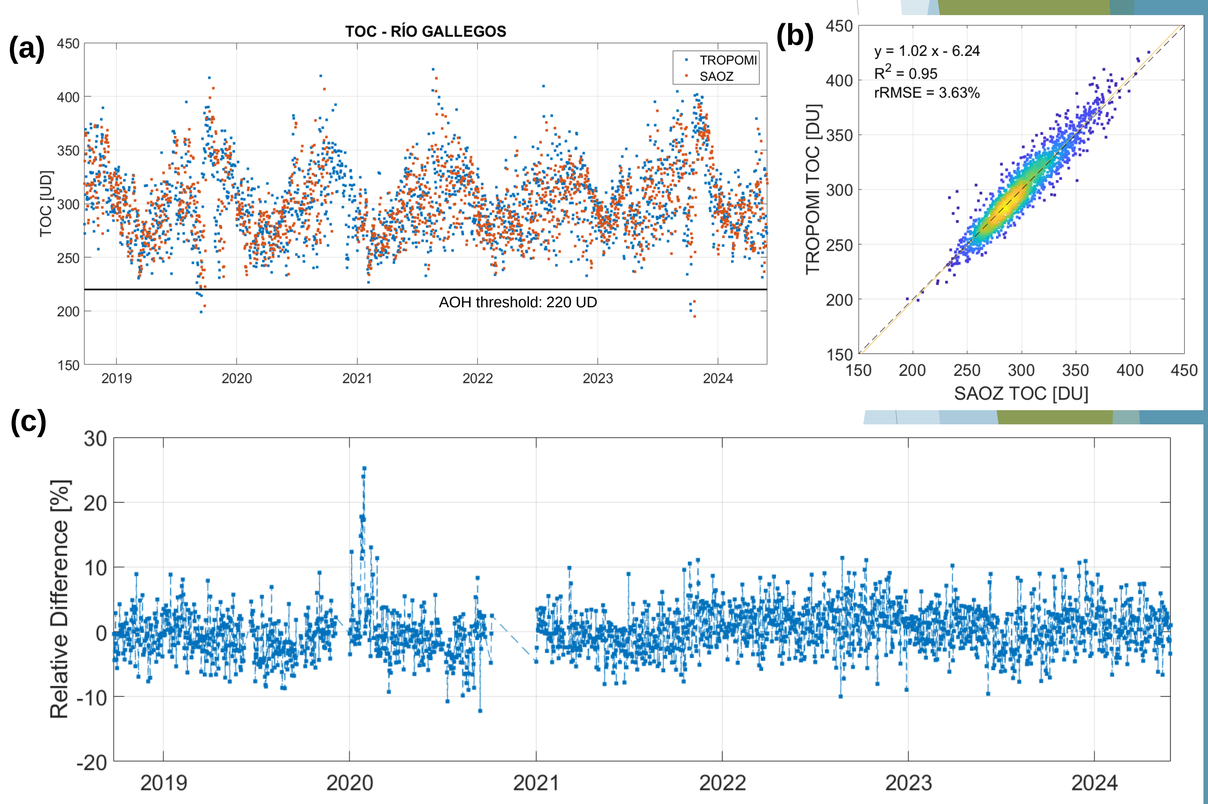

Figure 2. (a) TOC time series (b) Scatter plot and linear regression, and (c) Relative Difference (%) of the daily mean TCO from satellite and ground-based observations.

CONCLUSIONS

In this study, we present a comparison of the daily mean TCO obtained from satellite and ground-based observations using TROPOMI product data and the SAOZ instrument of the OAPA site (Río Gallegos, Argentina). The results reflect a very good correspondence. Therefore, TROPOMI data are presented as a good alternative for study the Antarctic ozone hole influence on Southern Patagonia, so we plan to incorporate them in future analyses.

REFERENCES

Lambert, J.-C.; Loyola, D.; McLinden, C.; Pazmino, A.; Pommereau, J.-P.; Redondas, A.; Romahn, F.; Valks, P.; et al., **2019**. TROPOMI/S5ptotal ozone column data: global ground-based validation and consistency with other satellite missions, Atmos. Meas. Tech., https://doi.org/10.5194/amt-12-5263-2019.

Orte, P.F.; Wolfram, E.A.; Salvador, J.O.; Mizuno, A.; Bègue, N.; et al., **2019**. Analysis of a southern sub-polar short-term ozone variation event using a millimetre-wave radiometer; Copernicus Publications; Annales Geophysicae; https://angeo.copernicus.org/articles/37/613/2019/, 37; 4; 7-2019; 613-629.