“Temperature behavior analysis during events of secondary effect of the ozone hole”

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Introduction

- Ozone has one of the most relevant roles in the atmosphere
- Ultraviolet radiation absorption
- Protection layer
- Severe decrease in ozone concentrations during austral springs
- Evidence of secondary effects in mid-latitudes regions

The decrease in ozone concentration has consequences in the temperature profile
Objectives

The main goal of the study was to verify the change in ozone and temperature profile during the event of influence of the Antarctic ozone hole in the south of Brazil.
Introduction

Ozone concentration

• Stratosphere (20 – 35 km)

• 90% of total ozone

https://ozonewatch.gsfc.nasa.gov/facts/SH.html
Introduction

Ozone layer and temperature

*Sounding from 11/10/00*

- Height (meters)
- Temperature (°C)
- Ozone partial pressure (nb)
Introduction

Antarctic ozone hole

- Austral spring (August – November)
- Temporary reduction of stratospheric ozone
- Seasonal phenomenon

Ozone concentrations ~ 220 UD
More intense between 12 and 24 km
Introduction

Secondary effect of the ozone hole

- Poor ozone air masses
- Reach mid latitudes regions
- Temporary reduction in total ozone column

Instruments

- Brewer Spectrophotometer MKIII #167 (Kipp & Zonen Inc.)
  - São Martinho da Serra/RS – Brazil (29.53°S, 53.85°W)
  - Daily average ozone measurements
Methodology

Instruments

• Sounding balloon
  • Ozone profile and temperature with height for October 21st
  • Climatology – 1996 - 1998

• Satellites TIMED/SABER, AURA/MLS and OMI-ERS.15
  • Ozone profile and temperature with height

• GPS-PRO (Radio Occultation)
  • Temperature with height
Results

Total Ozone column – Brewer data
October 18th to 24th, 2016

Potential Vorticity
October 14th to 24th, 2016

21% decrease
Results

OMI - AURA - GLobal Ozone Image

28 km
24 km
22 km
Results

Sounding locations

• October 19\textsuperscript{th} to 23\textsuperscript{rd}
Results

October 19\textsuperscript{th}, 2016

October 20\textsuperscript{th}, 2016

October 21\textsuperscript{st}, 2016

October 23\textsuperscript{rd}, 2016

(\text{a})

(\text{b})

(\text{c})

(\text{d})

Ozone Partial Pressure (\textmu Pa)

Altitude (km)

Atmo/MS

Climatology

Timod/Sabre

Climatology

Balloon Soundings

Atmo/MS

Climatology

Timod/Sabre

Climatology

245 km

25

120

60

45
Results
Conclusions

• There is an influence of Antarctic ozone hole over mid-latitudes

• On October 20\textsuperscript{th} was an extreme event
  
  • It was registered a very intense influence of the ozone hole over south America

• Data confirmed that ozone has an influence over temperature profiles in the stratosphere.