



# Stratospheric ozone in the American South cone and Antarctic Ozone Hole 1992–2007

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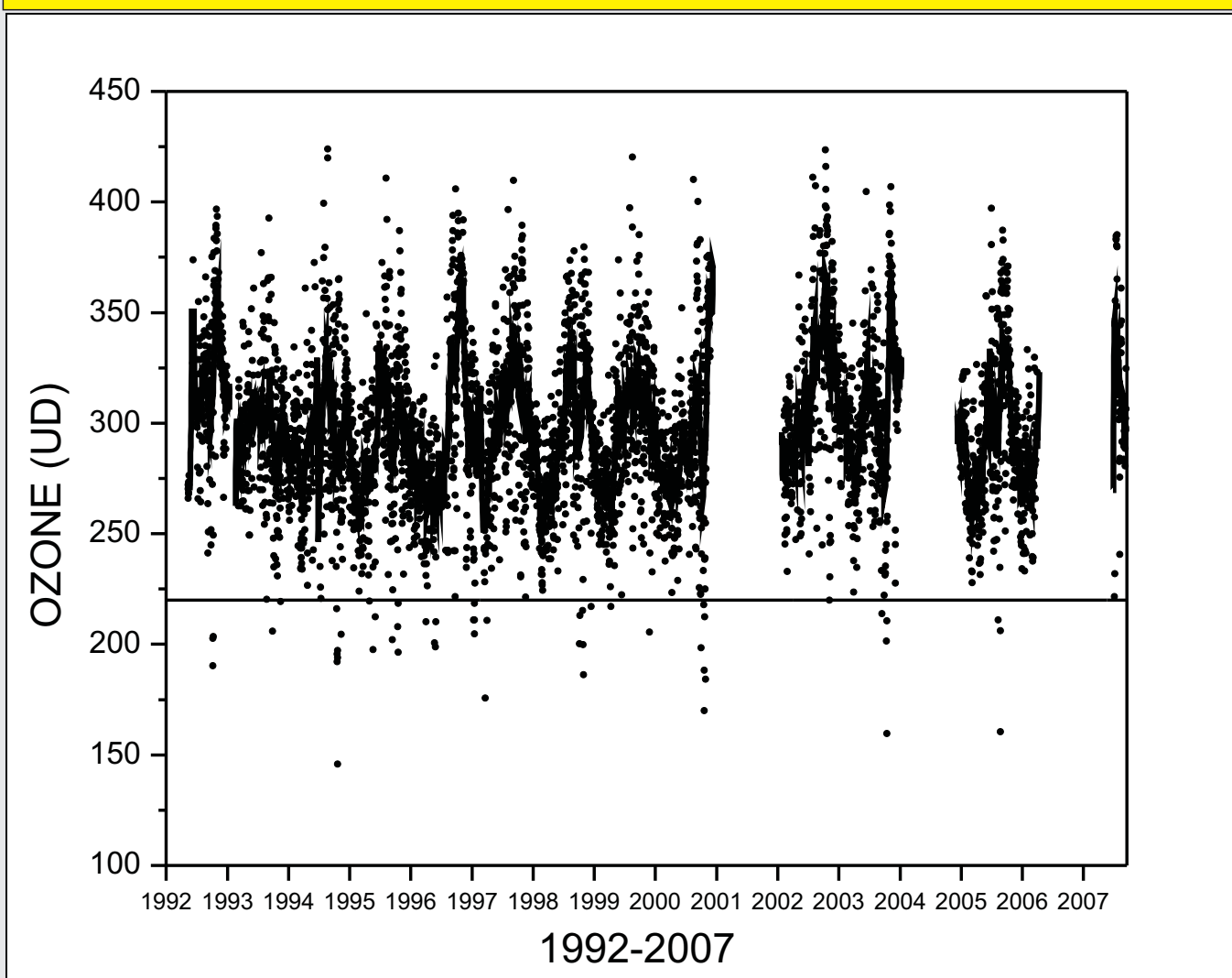
## ABSTRACT

During the recent decades there has been an increasing concern related to ozone layer and solar ultraviolet radiation, (UV-B: 280-320 nm), reaching the surface of the earth. The Antarctic Ozone Hole (AOH) is a phenomenon of strong ozone depletion in the Antarctic stratosphere, this is a consequence of heterogeneous chemical reactions and dynamical processes which enhance ozone losses by reactions with chlorine. Punta Arenas (53.0°S, 70.9°W) is the southernmost city in Chile with a population of approximately 120000. Due to its location, well within the area affected by the Antarctic Ozone Hole the ozone distribution is affected in different altitudes. Systematic observation of ozone and UV-B with a Brewer spectrophotometer have been made in order study during the ozone hole conditions. In addition, the vertical

Punta Arenas, Chile (53.2S;70.9W) is the southern most Chilean city, with about 120000 inhabitants.



Total ozone observed at Punta Arenas measured by Brewer instrument during 1992-2000. Dashed line represents the daily values, and the dark line represents a running average (n=30).



The number of days in which the Antarctic Ozone Hole (AOH) has been over the Magallanes region varies from year to year. Figure shows the number of events of low ozone to Punta Arenas. The criteria for defining an event of low ozone is that ozone column (daily average) must be lower than the reference (mean monthly climatological values for Punta Arenas from TOMS overpass data for the period 1978-1987), minus twice the standard deviation of the mean (mean monthly - 2). In the period of 1994-1999 there were many days of low ozone events during summer time. Between 2001 and 2003 there were fewer significant days showing a possible recuperation of the ozone over Punta Arenas. However, during 2004-2007 the days began to increase again

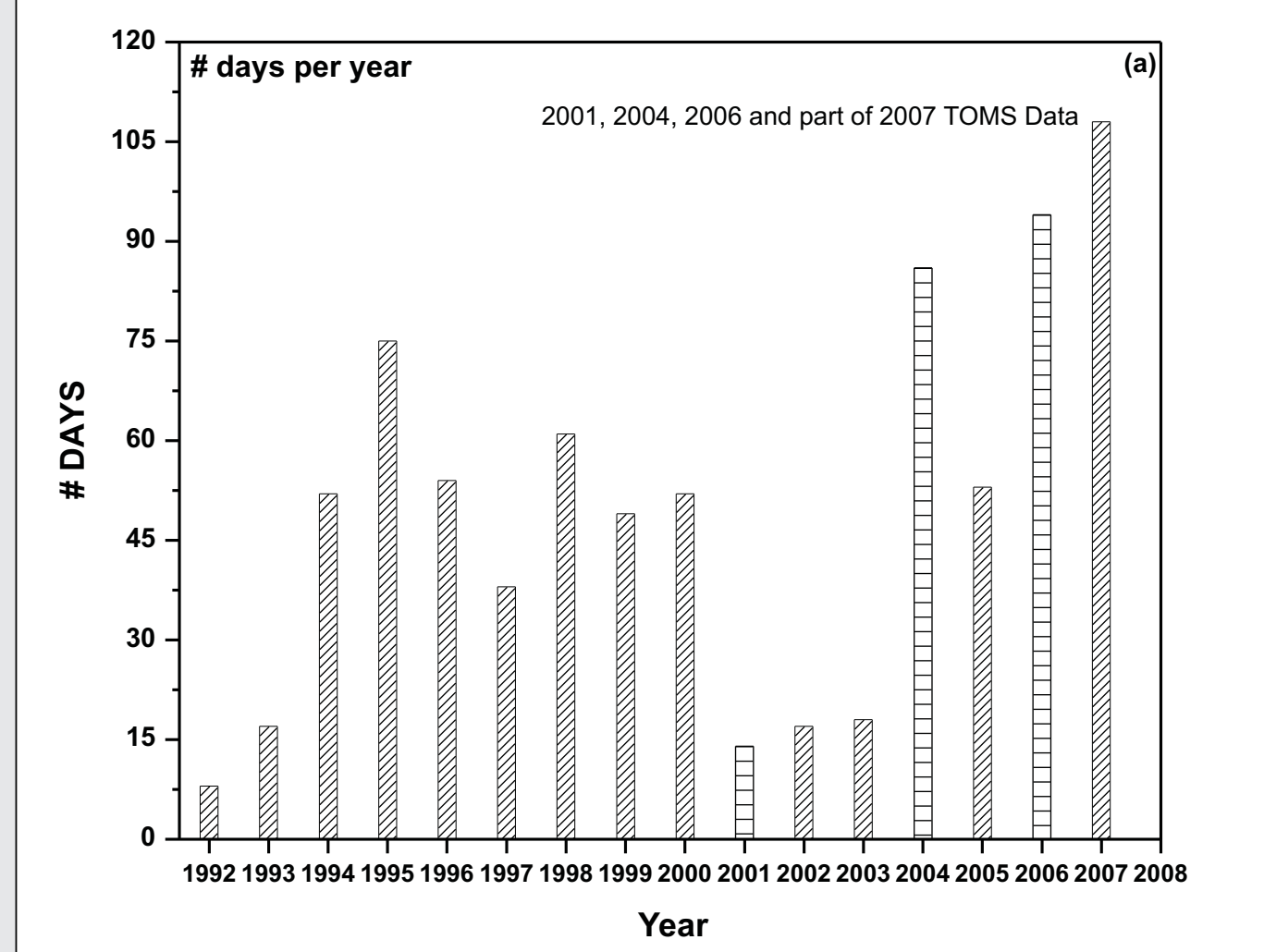
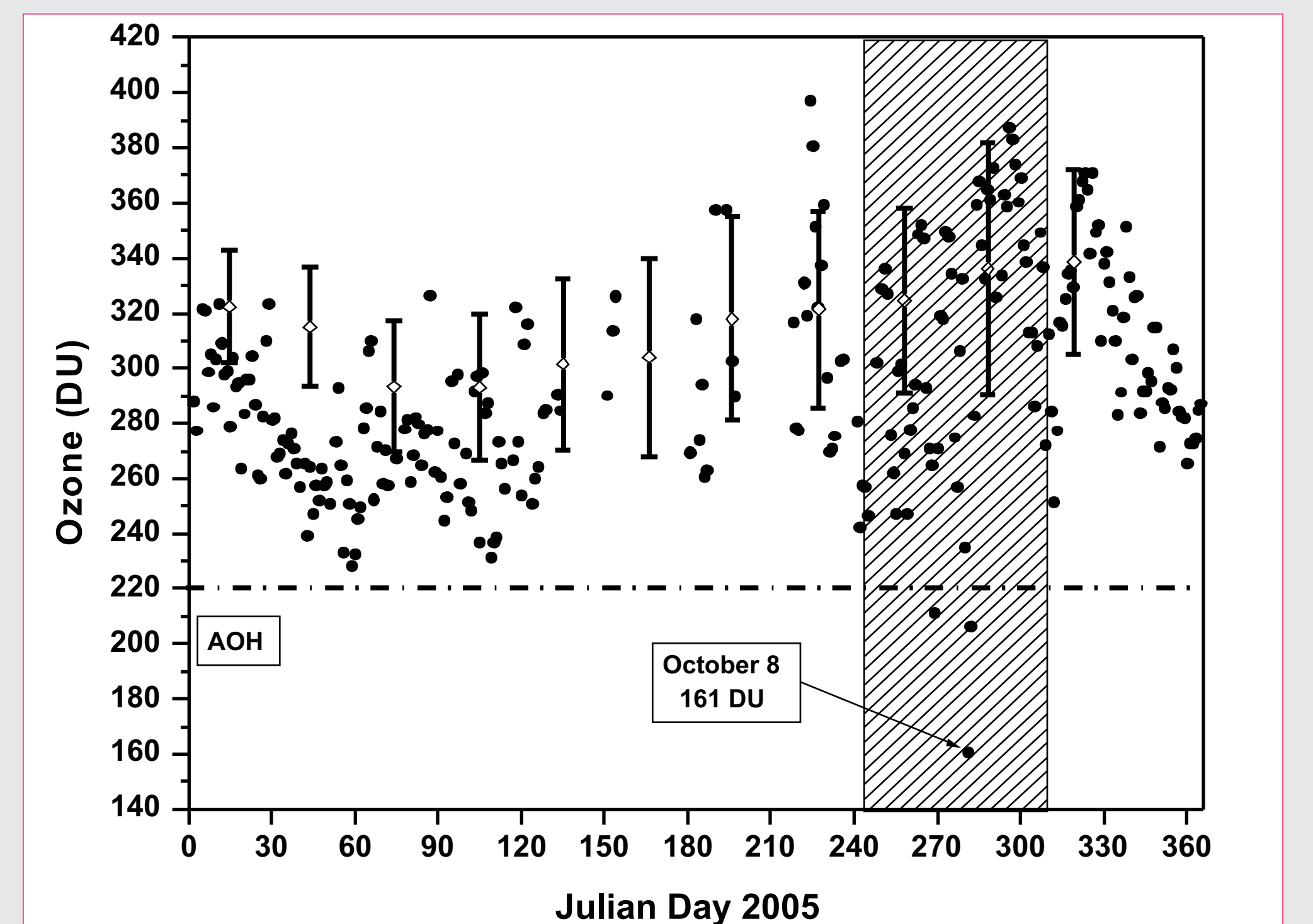


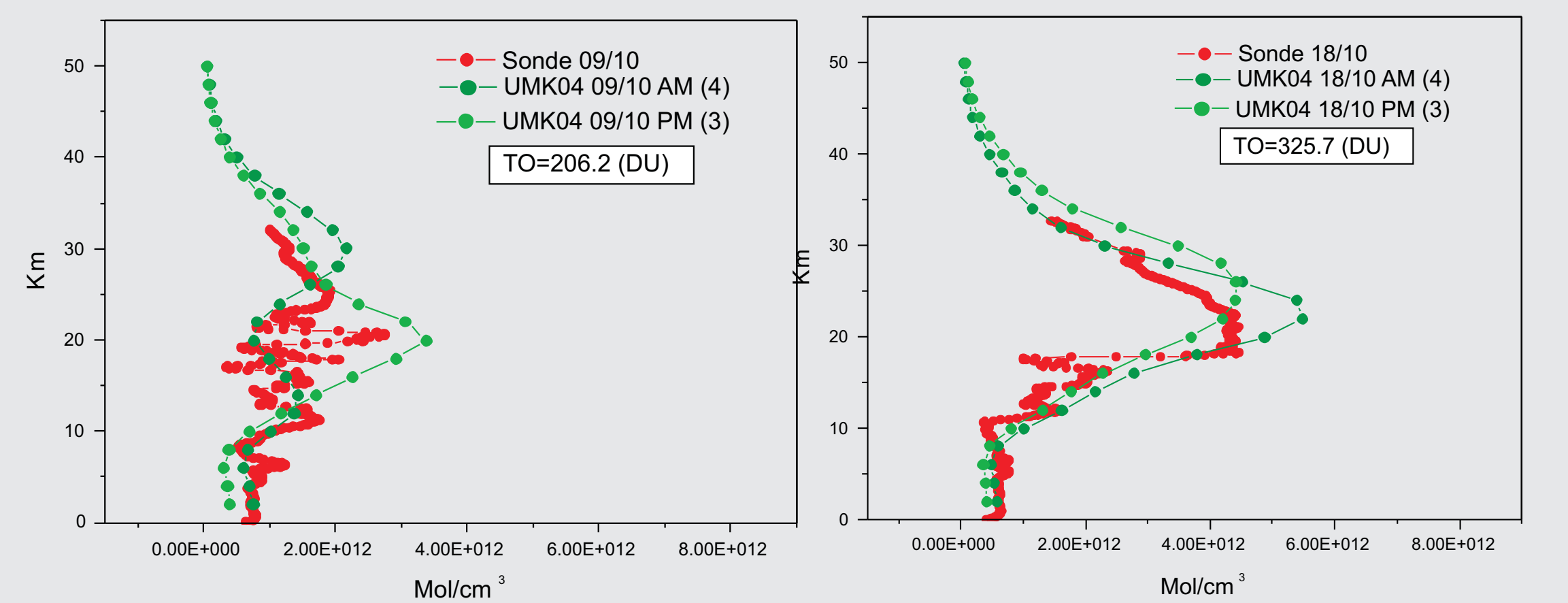
Table with date and information about the ozone soundings, October 7, 8 and 9 are days with low ozone values during spring 2005

Date	H Burst (km)	Pr.(Hpa)	TO <sub>3</sub> (DU)	Umkehr (Iterations)	
				AM	PM
30-Sep-2005	37.30	3.76	349.6	4	5
03-Oct-2005	35.72	4.21	274.8	3	4
04-Oct-2005	34.64	5.14	256.8	3	5
05-Oct-2005	28.26	13.25	306.1	3	3
06-Oct-2005	35.35	4.5	332.5	4	4
<b>07-Oct-2005</b>	<b>33.57</b>	<b>5.61</b>	<b>234.9</b>	3	5
<b>08-Oct-2005</b>	<b>32.87</b>	<b>6.1</b>	<b>160.4</b>	5	4
<b>09-Oct-2005</b>	<b>32.01</b>	<b>7.03</b>	<b>206.2</b>	4	3
10-Oct-2005	33.20	6.06	282.7	5	5
11-Oct-2005	33.00	6.82	359.4	4	5
12-Oct-2005	33.66	6.38	367.9	4	5
15-Oct-2005	25.47	22.77	364.6	5	3
18-Oct-2005	32.64	7.55	325.7	4	3
22-Oct-2005	32.49	8.12	358.8	3	5
24-Oct-2005	32.33	8.43	382.9	4	4
29-Oct-2005	31.61	9.25	338.4	3	3
30-Oct-2005	33.24	7.18	312.8	4	3
31-Oct-2005	31.06	9.46	313.3	5	3
01-Nov-2005	30.19	10.39	286.4	4	2
02-Nov-2005	36.96	4.27	307.9	3	4
06-Nov-2005	37.76	3.85	312.3	4	4
08-Nov-2005	18.10	71.97	251.3	3	4

Total ozone column year 2005 for Punta Arenas. Each point represents the mean for each day of the total ozone column obtained from the Brewer 180, The hatched area indicates the high activity period of the AOH over Punta Arenas from late August until end of October. Vertical bars show the mean values and their respective deviations to period 1978-1987; (Casiccia et al., 2003).



Same examples of ozone sonde (ECC) and Umkehr (Brewer 180) profiles. The Umkehr profile was obtained with the algorithm UMK04 (Petropavlovskikh, 2005) and O3BUmkehr v2.0 developed by Martin Stanek.



## Discussion

The results showed here are still preliminary. The Umkehr profiles under the influence of the Antarctic Ozone Hole we must study them with more detail, also the 'a priori' profiles. It is probable that important discrepancies should to the cloudiness conditions during the observations period in the region of Magallanes (Punta Arenas).

The number of days under average climate shows that the recovery of the ozone layer (if that is happening) at latitudes of the Magallanes region should be studied in more detail

## References:

- Casiccia, C., Kirchhoff, V.W.J.H. and Torres, A.C., 2003. "Simultaneous measurements of ozone and ultraviolet radiation: spring 2000, Punta Arenas, Chile". J. Atmos. Env. 37(3):383-389.
- Petropavlovskikh, I., P. K. Bhartia, and J. DeLuisi, "New Umkehr ozone profile retrieval algorithm optimized for climatological studies," Geophys. Res. Lett. 32, L16808, doi:10.1029/2005GL023323, 2005.
- Rodgers, C.D., Inverse methods for atmospheric sounding: Theory and Practice, Series on Atmospheric, Oceanic and Planetary Physics, Vol-2, 2000.
- Rodgers, C.D. and Connor, B.J., Intercomparison of remote sounding instruments, J. Geophys. Res., 108, D3, 2003.