

# CIRRUS CLOUD CHARACTERISTICS AT THE SOUTHERN-HEMISPHERIC MIDLATITUDE SITE OF PUNTA ARENAS (53°S, 71°W).

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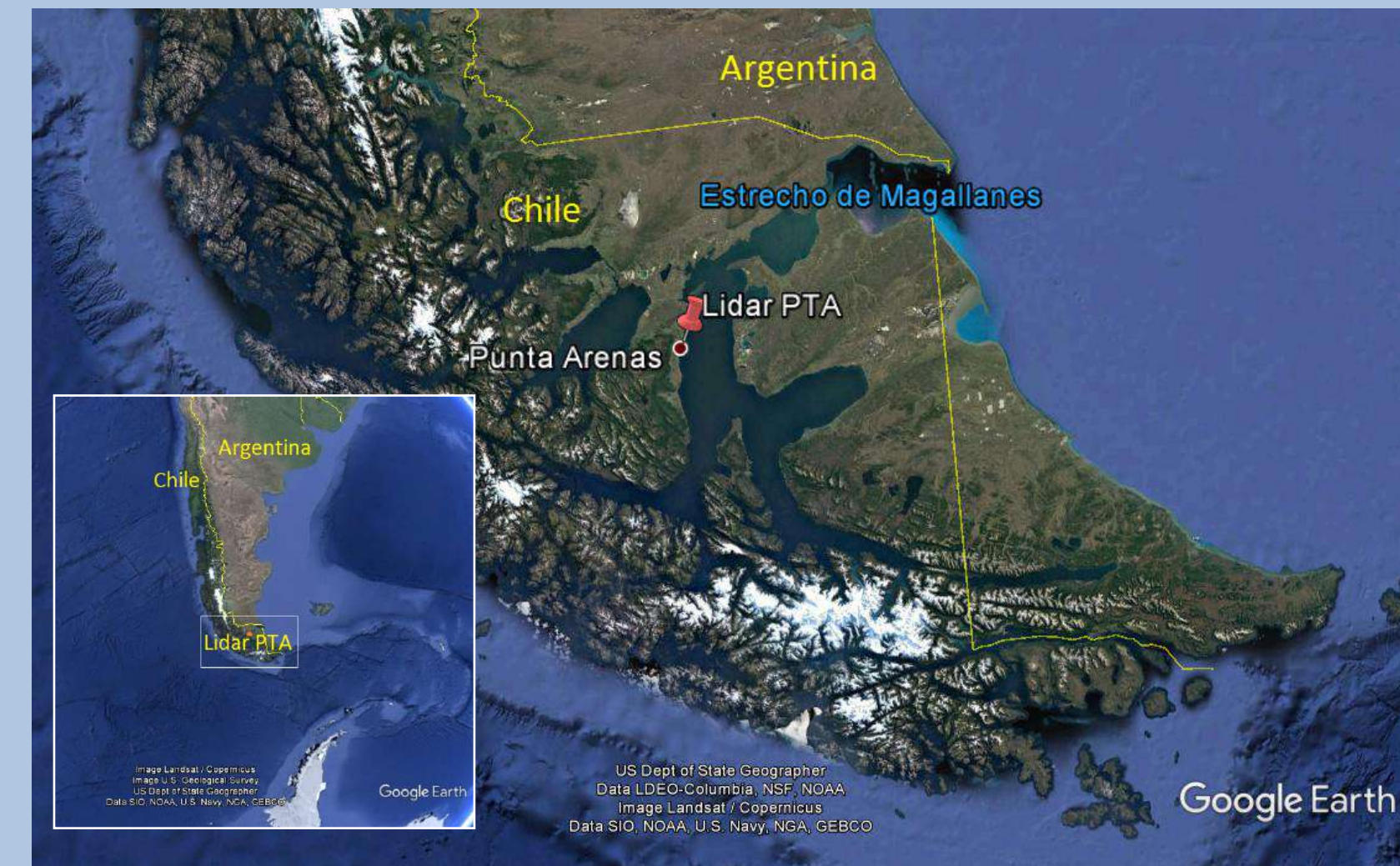


## Abstract:

Four years of lidar measurements from the lidar system installed in Punta Arenas, Chile (53°S, 71°W) in September 2016, were used to study cirrus clouds in the region. The present work report characteristics of cirrus clouds: vertical profile of the backscattering coefficient, base and top altitude, and depolarization ratio.

Since November 2018, the project Dynamics, Aerosol, Cloud And Precipitation Observations in the Pristine Environment of the Southern Ocean (DACAPO-PESO), was conducted at Punta Arenas until end of 2021. This project include a Raman polarization lidar of type Polly-XT which is capable to provide information to detect cirrus clouds, as well. We reported one cirrus cloud case study using both instruments.

Punta Arenas Site (PTA)  
53.13° S, 70.88° W, 10 m asl



## Instrumentation: Multi-wavelength raman depolarization lidar:



- Elastic Channels: **1064**, 532, and 355 nm.
- Raman Channels: 384 nm, 408 nm and 607 nm.
- Polarization s/p (**532 nm** and 355 nm)
- Temporal Resolution: 3 minutes every 15 minutes on a 24 h / day basis.



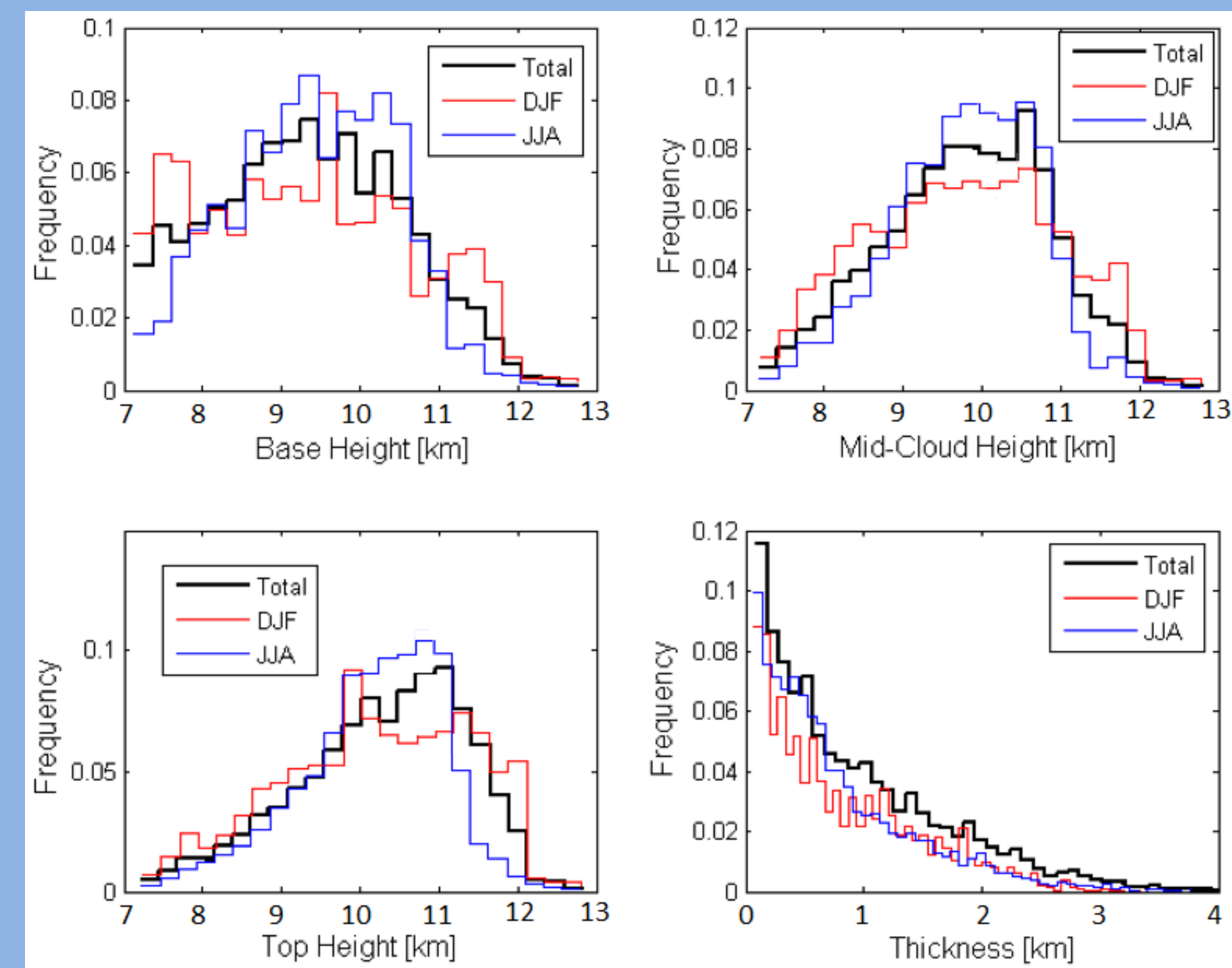
## Methodology:

Lidar signal are processed with the method reported by Gouveia et al. [1]. The method used only the the lidar elastic backscattering signal at 532 nm, also the depolarization of the lidar signal, considering multiple scattering. Information from the JAXA EarthCARE Research A-train Product Monitor [2] was used to evaluate the behavior of cirrus clouds from another source of information.

For the analysis of cirrus clouds case we used information and images produced with measurements from Punta Arenas lidar and the pollyXT.

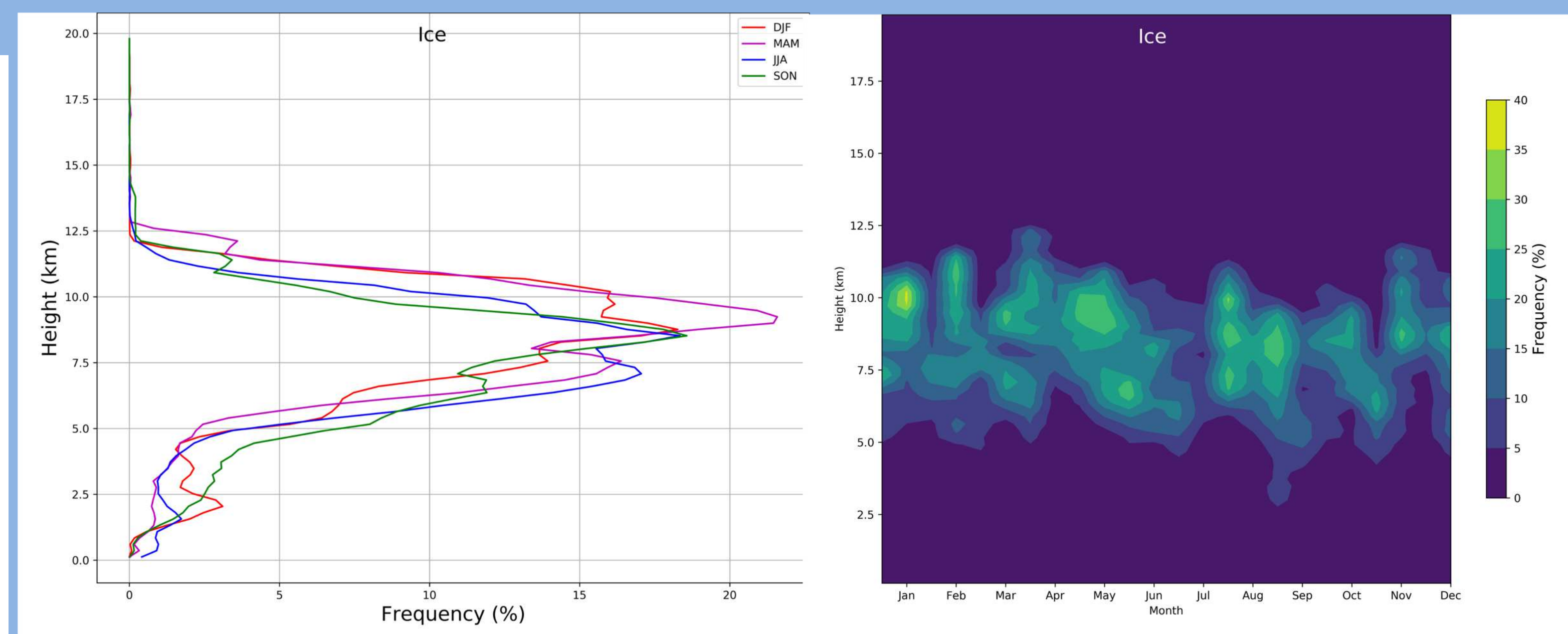
## Results:

### Geometrical Characteristics 2016- 2020. Punta Arenas Lidar



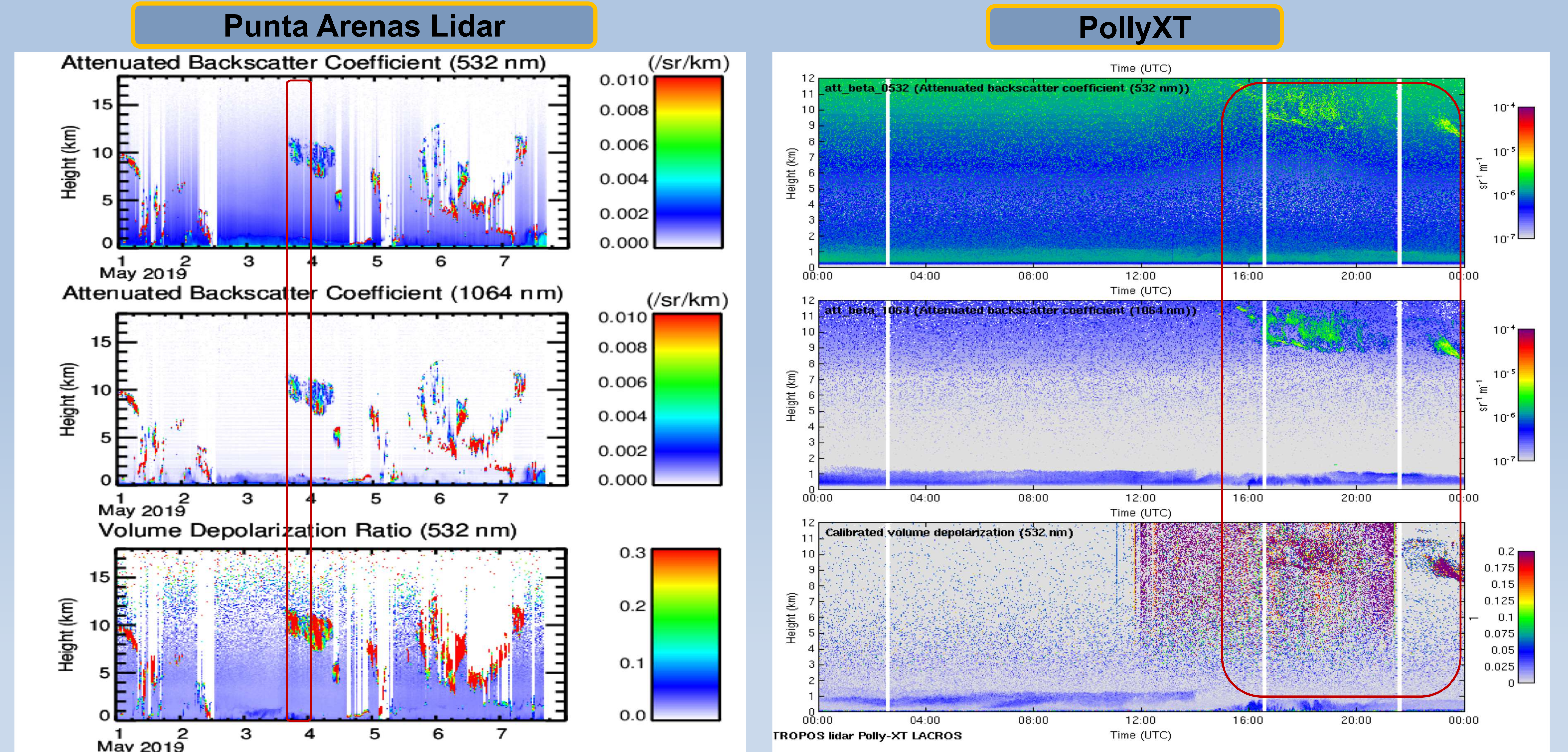
The frequency of occurrence show higher presence of cirrus clouds during autumn season (MAM). There is a consistency between the results from four years of lidar observation and nine years of satellite product.

### Frequency of occurrence profile of ice in Punta Arenas during the period of 2006 to 2014. From radar/lidar clouds microphysics



	Total	DJF	MAM	JJA	SON
Occurrence [%]	58.0	57.6	64.8	52.7	58.7
Base Altitude [km]	9.1	8.7	8.9	9.1	9.2
std. dev.	2.1	1.9	2.5	2.1	2.0
Top Altitude [km]	10.8	10.1	10.8	9.7	9.9
std. dev.	2.2	2.2	2.2	1.8	2.3
Thickness [km]	1.88	2.00	1.97	1.74	1.90
std. dev.	1.03	0.91	1.01	1.00	0.83

### Comparison of the PollyXT and Punta Arenas lidar measurements of cirrus clouds during May 3<sup>rd</sup> 2019, between 15:30 and 23:59 UTC.



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