

## Final project report

<i>Project ID</i>	2002/6.02
<i>Title</i>	LONA (Lidar Observatories for NDSC in Antarctica)
<i>Principal investigator</i>	Di Donfrancesco Guido
<i>Institution</i>	ENEA-CLIMOSS
<i>Email</i>	guido.didonfrancesco@enea.it
<i>Duration</i>	2 years
<i>Assigned funding</i>	60.000,00 Euro

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### Activities and results

The main objective of the proposal is related to the ozone loss as well as to the climatic changes, and is constituted by regular semi-automatic monitoring of the Antarctic stratosphere by means of lidar instrumentation, that has been working from many years in Antarctica at McMurdo and Dumond d'Urville stations. Both the stations are part of the Network for Detection of the Stratospheric Change (NDSC).

The activities could be summarized in:

- 1) Continuation of the decennial database of lidar measurements of polar stratospheric aerosol and temperatures;
- 2) Implementation of hardware and software on both the systems to permit semi-automatic measurements and real-time analysis (in collaboration with the French CNRS partner);
- 3) Analysis of the raw data for the NDSC database;
- 4) Complementary measurements, during the polar winter, of balloon borne instrumentation for measurements of ozone and aerosol sizes, in collaboration with University of Wyoming, Prof. Terry Deshler.

The main results of the project are:

- 1) A decennial climatology of PSCs above McMurdo with emphasis on their optical/microphysics properties with respect the formation mechanism;
  - 2) An intercomparison of Arctic and Antarctic PSCs;
  - 3) A database of optical properties of PSCs with a separation of different cloud types according to their scattering and depolarization values.
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### Products

#### A – papers in scientific magazines

1. [Maturilli, M.](#), [Neuber, R.](#), [Massoli, P.](#), [Cairo, F.](#), [Adriani, A.](#), [Moriconi, M. L.](#) and [Di Donfrancesco, G.](#), Differences in Arctic and Antarctic PSC occurrences observed by lidar in Ny-Ålesund (79 N, 12 E) and McMurdo(78 S, 167 E) Atmos. Chem. Phys. Discuss., Vol. 4, pp 6837-6866, 26-10-2004.
2. A. Adriani; P. Massoli; G. Di Donfrancesco; F. Cairo; M. Moriconi; M. Snels, "Climatology of polar stratospheric clouds based on lidar observations from 1993 to 2001 over McMurdo Station, Antarctica", J. Geophys. Res., 109, D24211, doi:10.1029/2004JD004800 (2004).
3. C. David, S. Bekki, N. Berdunov, M. Marchand, M. Snels and G. Mégie, "Classification and scales of Antarctic polar stratospheric clouds using wavelet decomposition", Journal of Atmospheric and Solar-Terrestrial Physics, volume 67, issue 3, (2005) 293-300.
4. C. Scarchilli, Alberto Adriani, Francesco Cairo, Guido Di Donfrancesco, Carlo Buontempo, Marcel Snels, Maria Luisa Moriconi, Terry Deshler, Niels Larsen, Beiping Luo, Konrad Mauersberger, Joelle Ovarlez, Jim Rosen and Jochen Schreiner, "Determination of PSC Particle Refractive Indexes using In Situ Optical Measurements and T-Matrix Calculations", Applied Optics 44, 3302-3311 (2005).
5. M. Höpfner, B.P.Luo, P.Massoli, F. Cairo, R. Spang, M. Snels, G. Di Donfrancesco, G. Stiller, T. von Clarmann, H.

## Programma Nazionale di Ricerche in Antartide (PNRA)

Fischer and U. Biermann, "Spectroscopic evidence for NAT, STS and ice in MIPAS infrared limb emission measurements of polar stratospheric clouds", Atmos.Chem.Phys. 6, 1201-209 (2006).

### B – book chapters

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### C - proceedings of international conferences

1. Michael Hoepfner, Niels Larsen, Reinhold Spang, Bei Ping Luo, Jun Ma, Synne Svendsen, Stephen Eckermann, Paola Massoli, Francesco Cairo, Marcel Snels, Guido Di Donfrancesco, Bjoern Knudsen, Uta Biermann, Gabriele Stiller, Thomas von Clarmann and Herbert Fischer, MIPAS discovers Antarctic nitric acid trihydrate (NAT) polar stratospheric cloud (PSC) belt Atmospheric Science Conference, 8-12 May, 2004-ESRIN, Frascati, Italy.
2. Di Donfrancesco G., F. Cairo, R. Morbidini, M. Viterbini, M. Snell, C. Buontempo, Characterization of Clouds and Aerosols by Optical Devices, Geophysical Research Abstracts, Vol. 6, 06956, 2004, proceedings of the EGU General Assembly.
3. D'Aulerio P., F. Cairo, G. Di Donfrancesco, R. Morbidini, M. Snels, M. Viterbini, T. Deshler, Presentation of the new McMurdo lidar, Geophysical Research Abstracts, Vol. 7, 06363, 2005, proceedings of the EGU General Assembly.

### D – proceedings of national meetings and conferences

### E – thematic maps

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### F – patents, prototypes and data bases

### G – exhibits, organization of conferences, editing and similar

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### H - formation (PhD thesis, research fellowships, etc.)

1. PhD thesis on Polar Science (Università di Siena), Dr. Claudio Scarchilli

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## Research units

- COL/ENEA Dr. Guido Di Donfrancesco
- COL/CNR Dr. Marcel Snels  
Dr.ssa Paola Massoli  
Dr.ssa Marisa Moriconi  
Dr. Claudio Scarchilli

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**Date: 31/12/2009**

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