Dust Emission from Patagonia (DFP)

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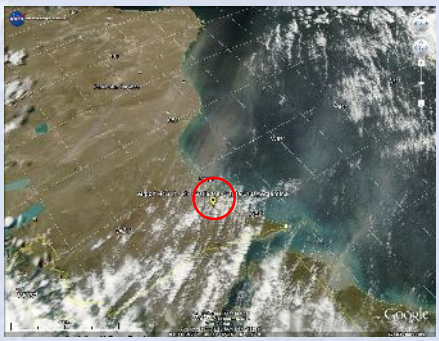
ABSTRACT

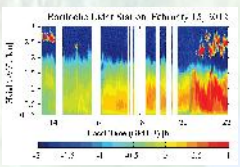
We use a combined approach including ground level aerosol sampling, LIDAR measurements and simulations to identify dust emission from Southern Patagonia. Starting from December 2011, we plan to acquire a continuous 2-years measurement series of weekly accumulated aerosol concentrations at Rio Gallegos (51°S 69°W) coupled with LIDAR monitoring and a dust optical response model. Laboratory chemical analysis of the aerosols will include elemental composition, solubilisation kinetic and mineralogical determination.

Results from LIDAR will indicate when the aerosol vertical layer is continuous and when a vertical extrapolation can be made from the ground to the top of the layer. The LMDz model coupled with INCA module (Interactions between Chemistry and Aerosols) will be used to simulate dust episodes over the region. Expected deliverables are estimation of the amount of dust exported from Patagonia towards the South Atlantic, its chemical properties, including bioavailability simulation, simulation from model and comparison to experimental measurements.



Dust export over Rio Gallegos (red circle), picture from NASA. Wind fields are from west (left, Patagonia) to East (right, Atlantic Ocean).

LIDAR Station at Rio Gallegos



Volcanic dust lifted from ground during the afternoon of February 15, 2012. Red color indicates dust.

Aerosol LIDAR stations planned

Filtration system at Rio Gallegos (Argentina) 51°37'57.70"S; 69°13'41.64"W

"GAMEL" system to generate aerosols from soil samples. Comparisons will be done with collected aerosols and lichens

Vibrating flask

Filtration devices

10 µm cut-off cyclone

Generated dust on a filter

Dust aerosol naturally generated

SOIL COMPOSITION	SiO_2	Al_2O_3	Fe_2O_3	CaO	K_2O	Na_2O	MgO
Average Composition %	71.1	16.1	5.6	2.9	1.63	1.57	-
RSD (40 samples)	6%	7%	29%	43%	16%	28%	-
	Ti*	Mn	Sr	Cr	Zr	V	
Average Composition %	0.45	0.11	0.031	0.021	0.018	0.013	
RSD (40 samples)	14%	24%	28%	55%	18%	24%	

Very stable soil composition except for Ti: one sample taken on volcanoes is removed for this element

Sampling locations: hollow circles, soils only. Black circles, soils + lichens

Soil sampling

Lichens

EXPECTED DELIVERABLES: 2013

1. Estimation of the amount of dust exported from Argentina toward the South Atlantic and sub-antarctic circulation.
2. Chemical properties, including bioavailability simulation, of the exported aerosol.
3. Dust and aerosol simulation from model and comparison to experimental measurements