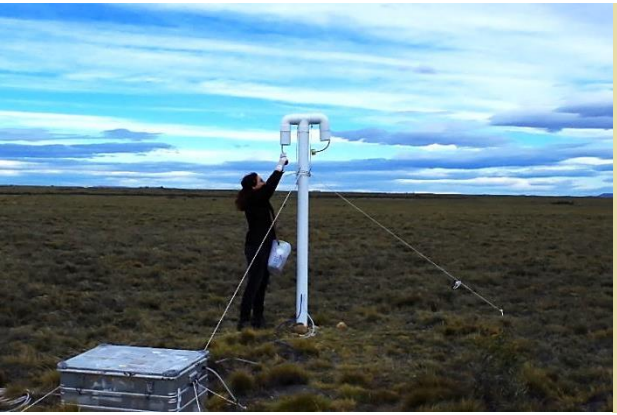

Temporal variability and meteorological control of mineral aerosol in the south Patagonia

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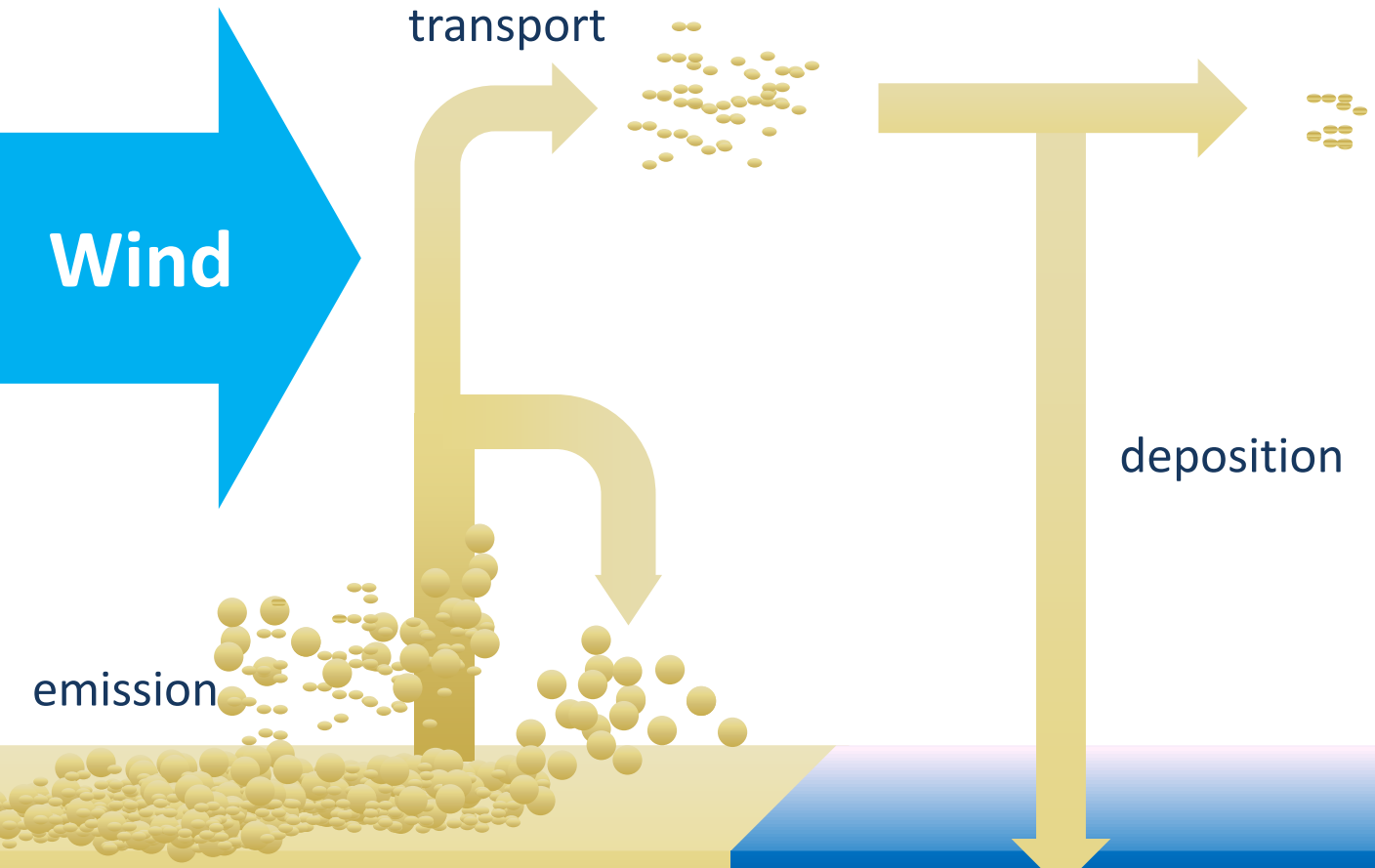
Contents

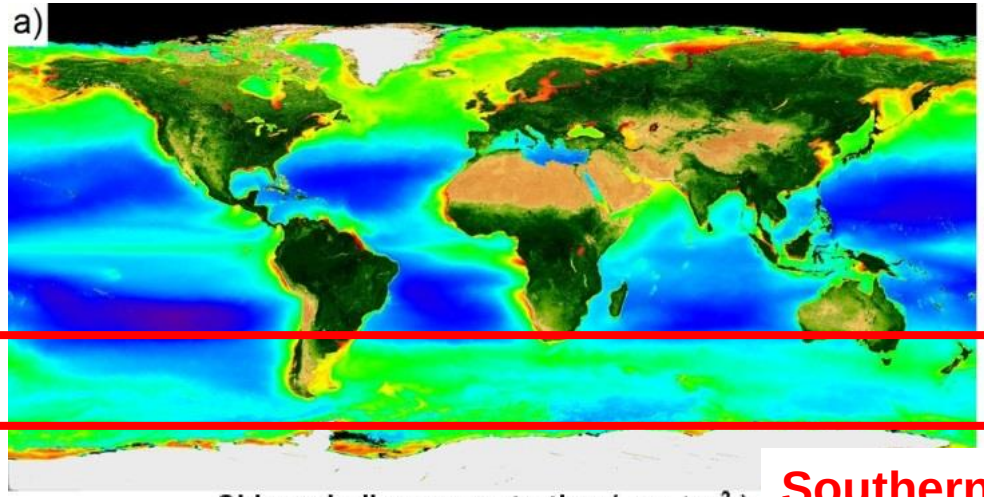
Background

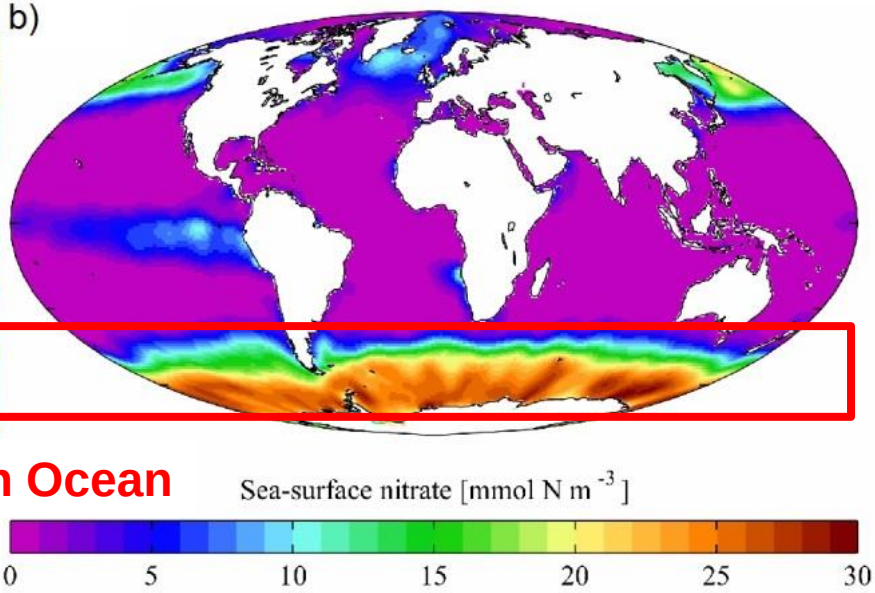
Dust biogeochemical cycles



$$\mathrm{Fe}_{\text{mineral dust}} \rightarrow \mathrm{Fe}_{\text{dissolved}}$$

Nitrate & Chlorophyll concentration in surface seawater

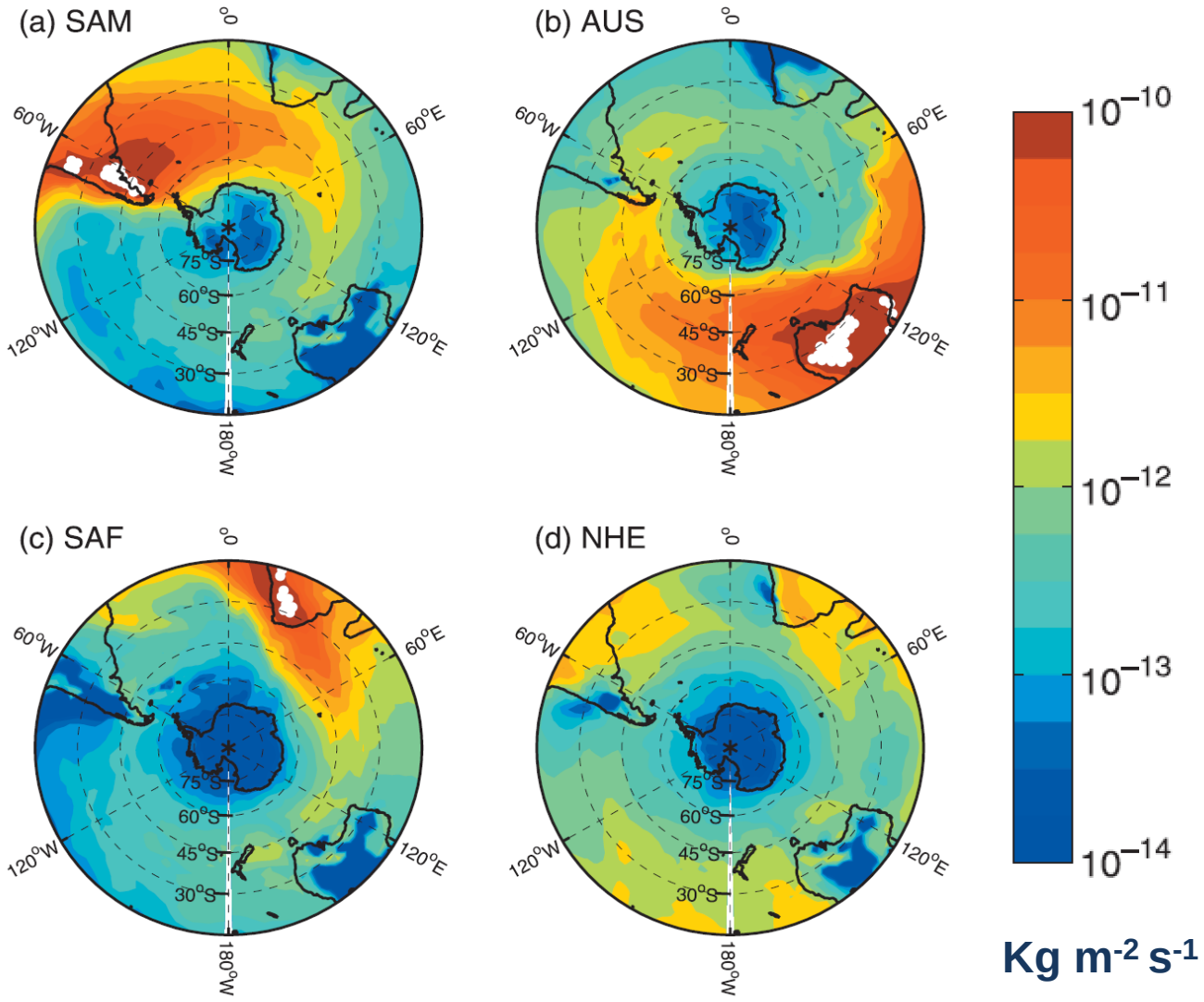




Southern Ocean

Source: NASA SeaWiFs

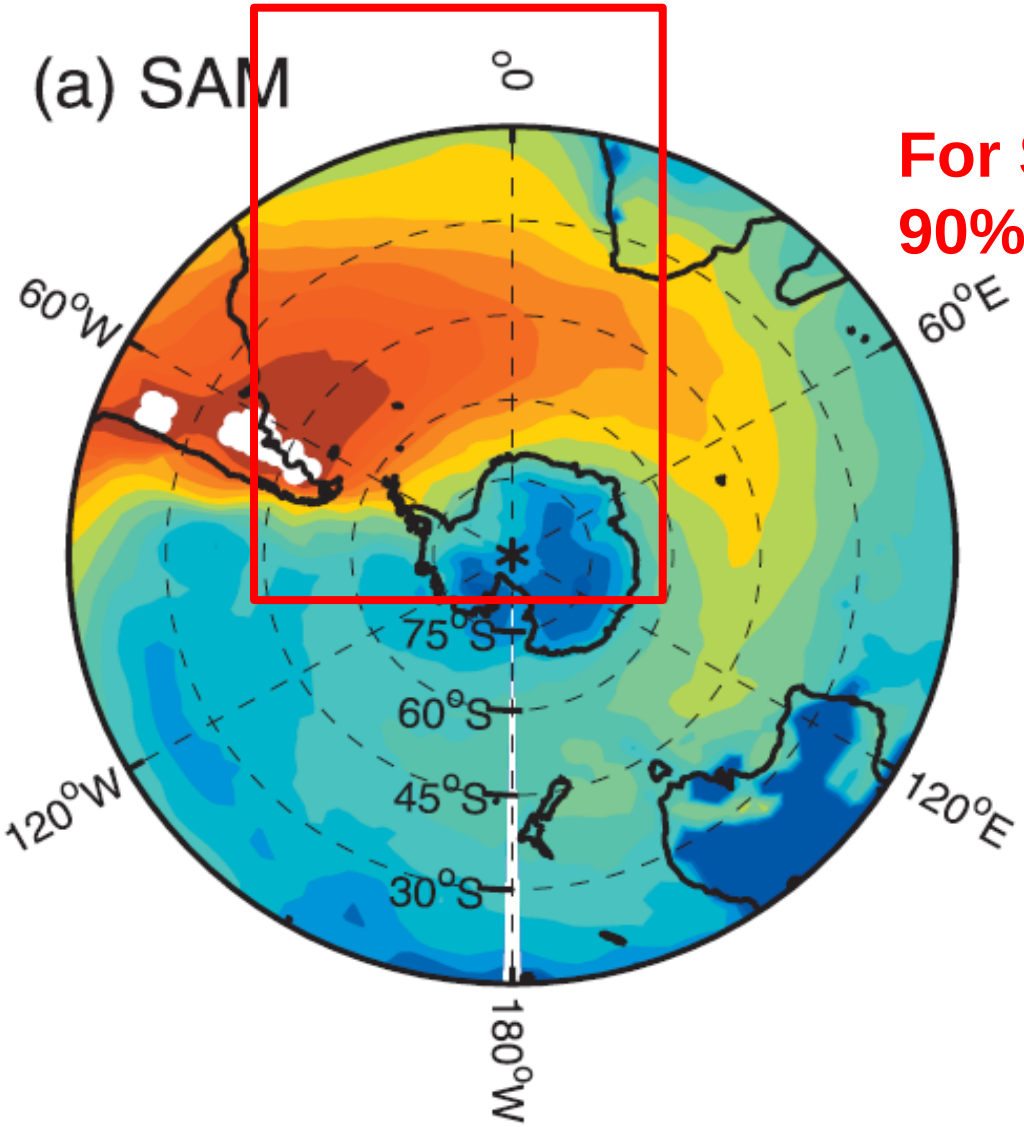
Contribution to the dust deposition into Southern Ocean



SAM: 58%
AUS: 36%
SAF: 2%
NHE: 3%

Source:
Li et al., 2008
GFDL GCM AM2 model results

Contribution to the dust deposition into Southern Ocean



For South Atlantic Ocean:
90% from South America

Source:
Li et al., 2008
GFDL GCM AM2 model results

Object

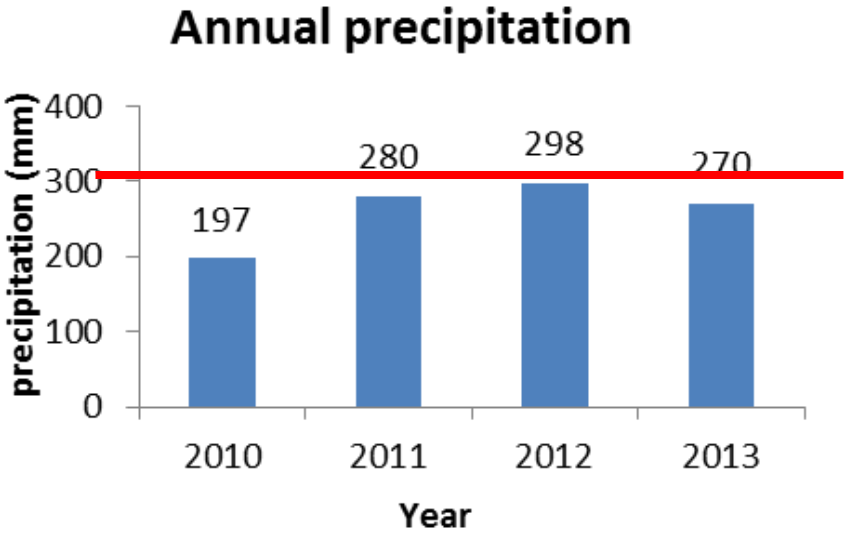
Object

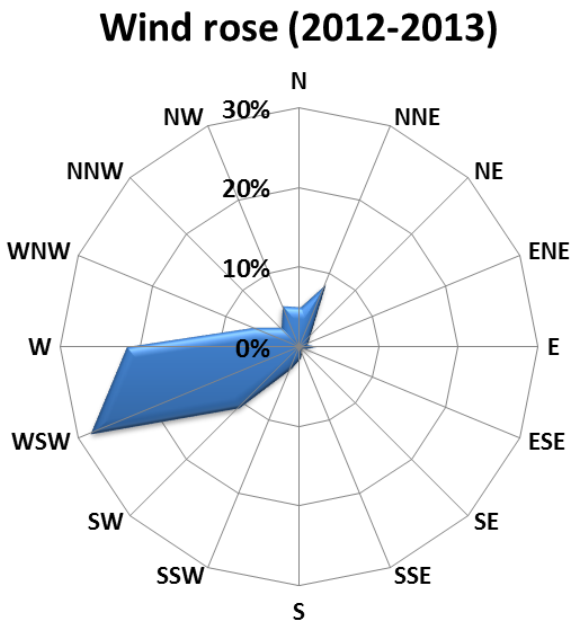
1. Measure the dust concentration and composition over Patagonia

2. Pattern and origin of temporal variability of aerosol concentration

Methodology

Aerosol sampling





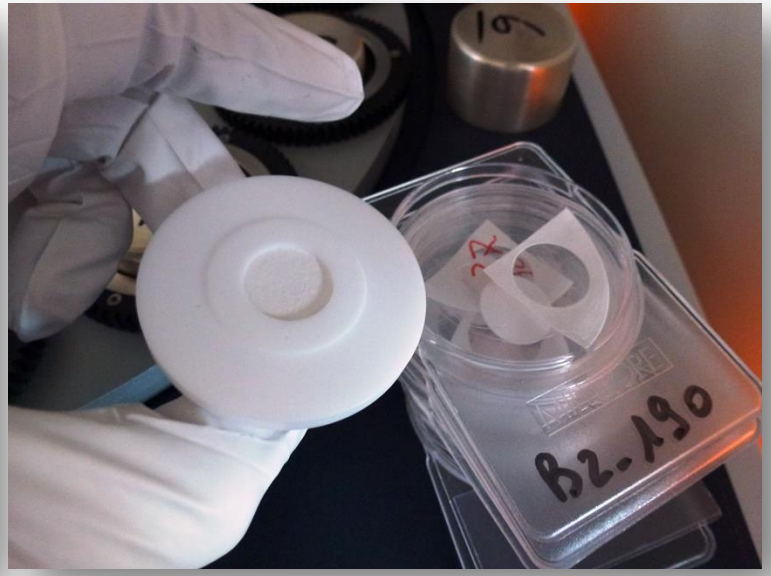
Aerosol sampling

- **filters changed every week**

Analytical method

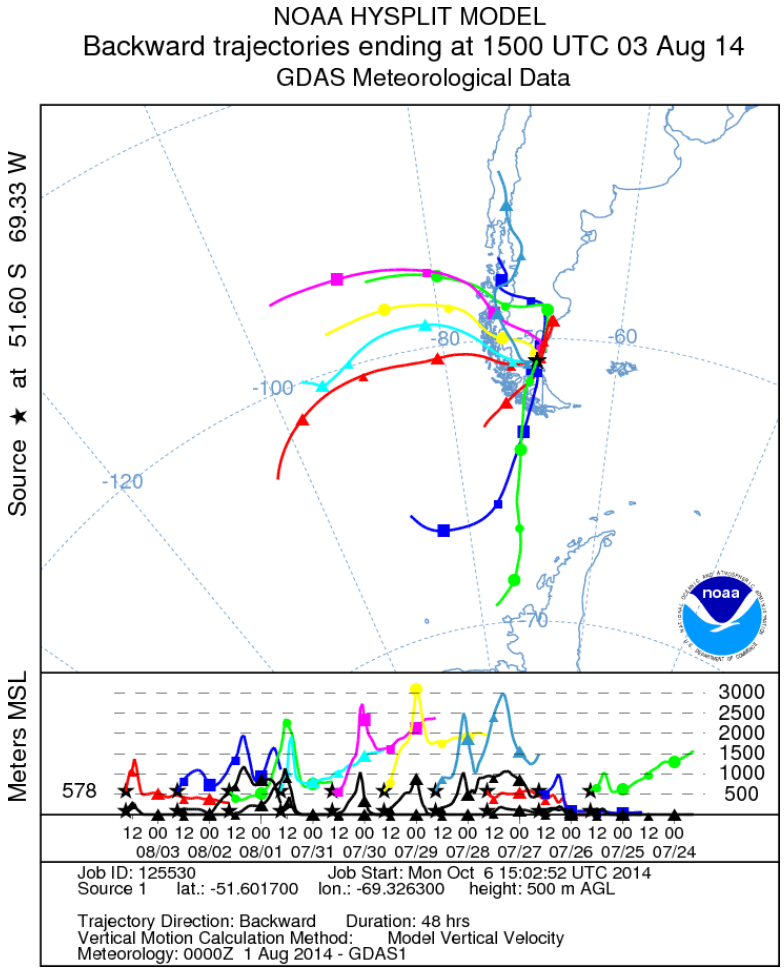
Ref. of Dust:	**Si**	**Al**	**Fe**
Ref. of Sea Salt:	**Na**		

- EDXRF: Energie Dispersive X-Ray Fluorescence
- Inter-calibration par ICP-AES

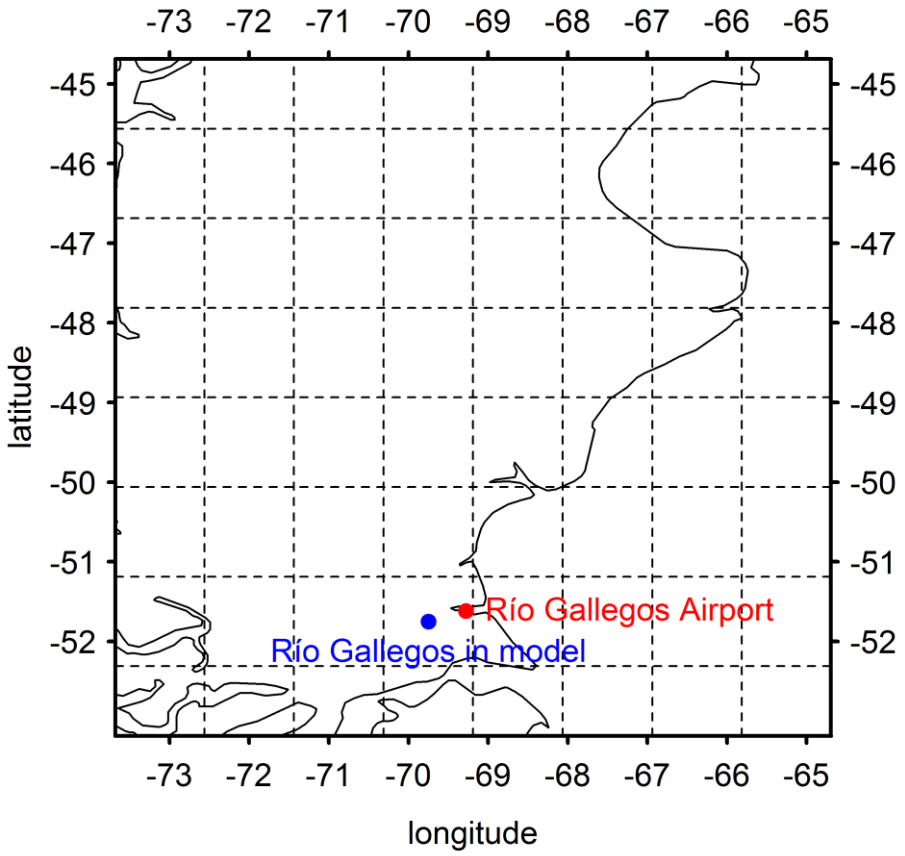


HYSPLIT model backtrajectories

Configuration:
48 hrs trajectory
start a new trajectory every 24 hrs
500m above ground level



Wind reanalysis using ECMWF model

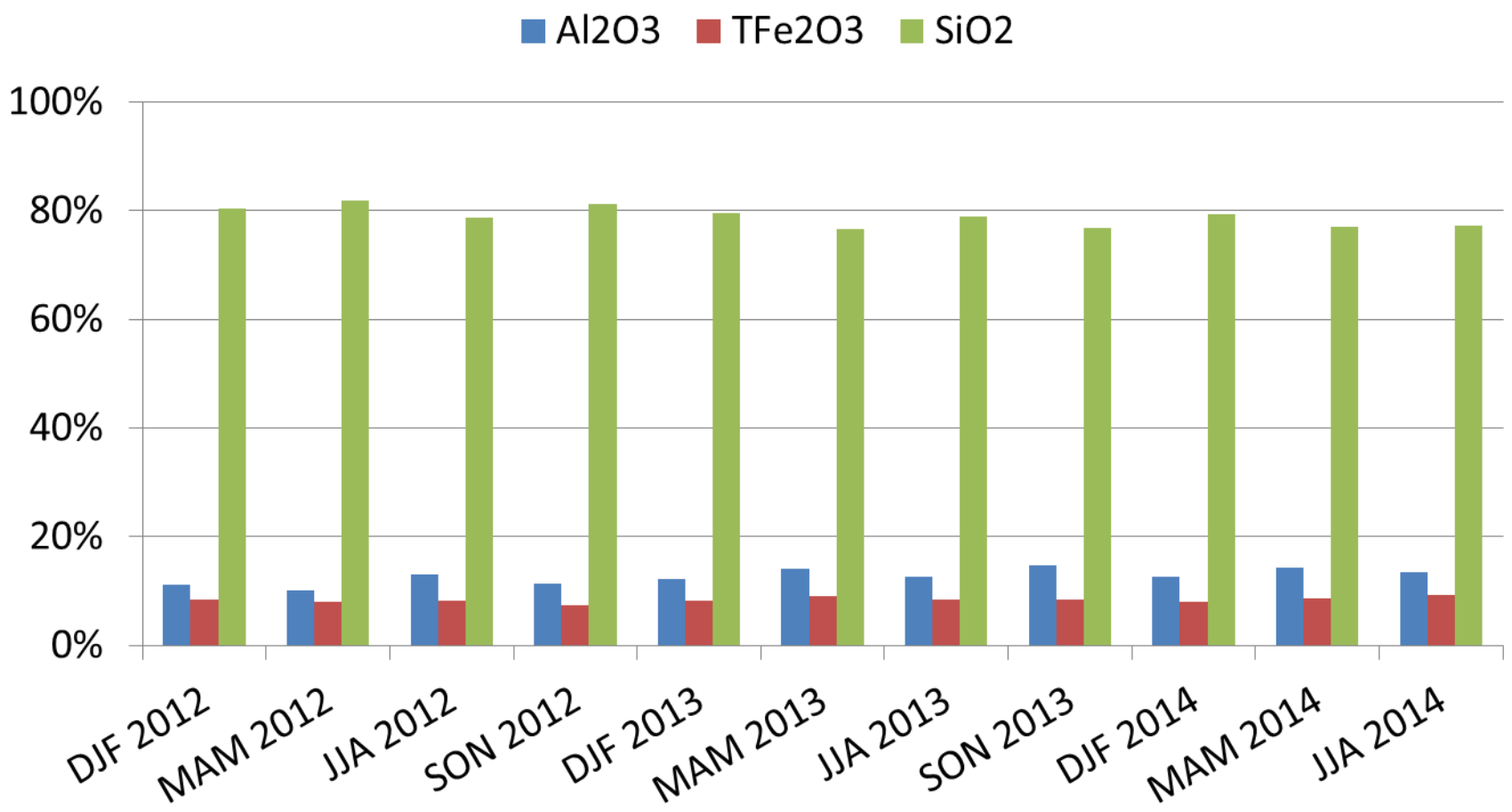


Reanalysis of wind speed over Patagonia using ECMWF model

Resolution: 1.125° ×1.125°

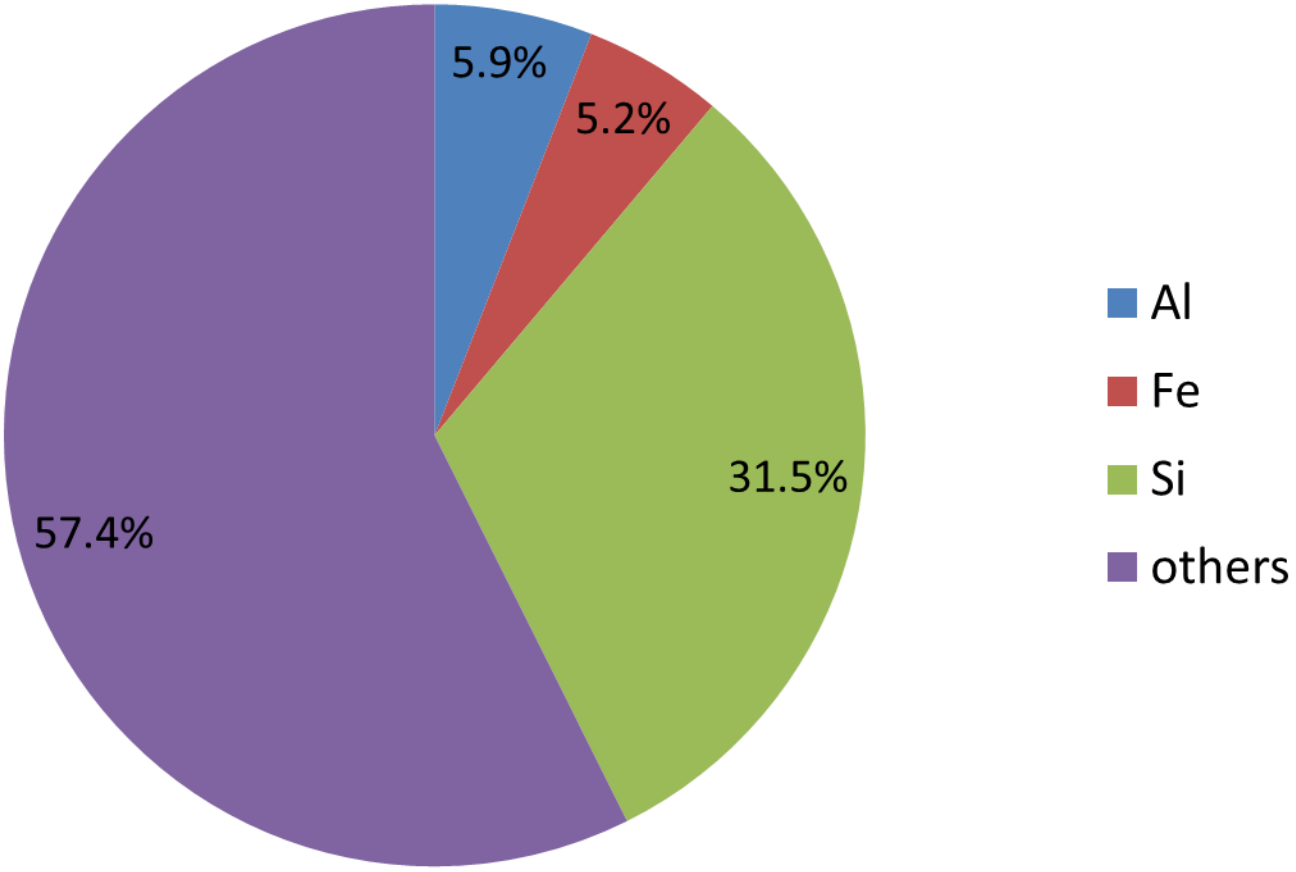
Results

Aerosol composition variation by month

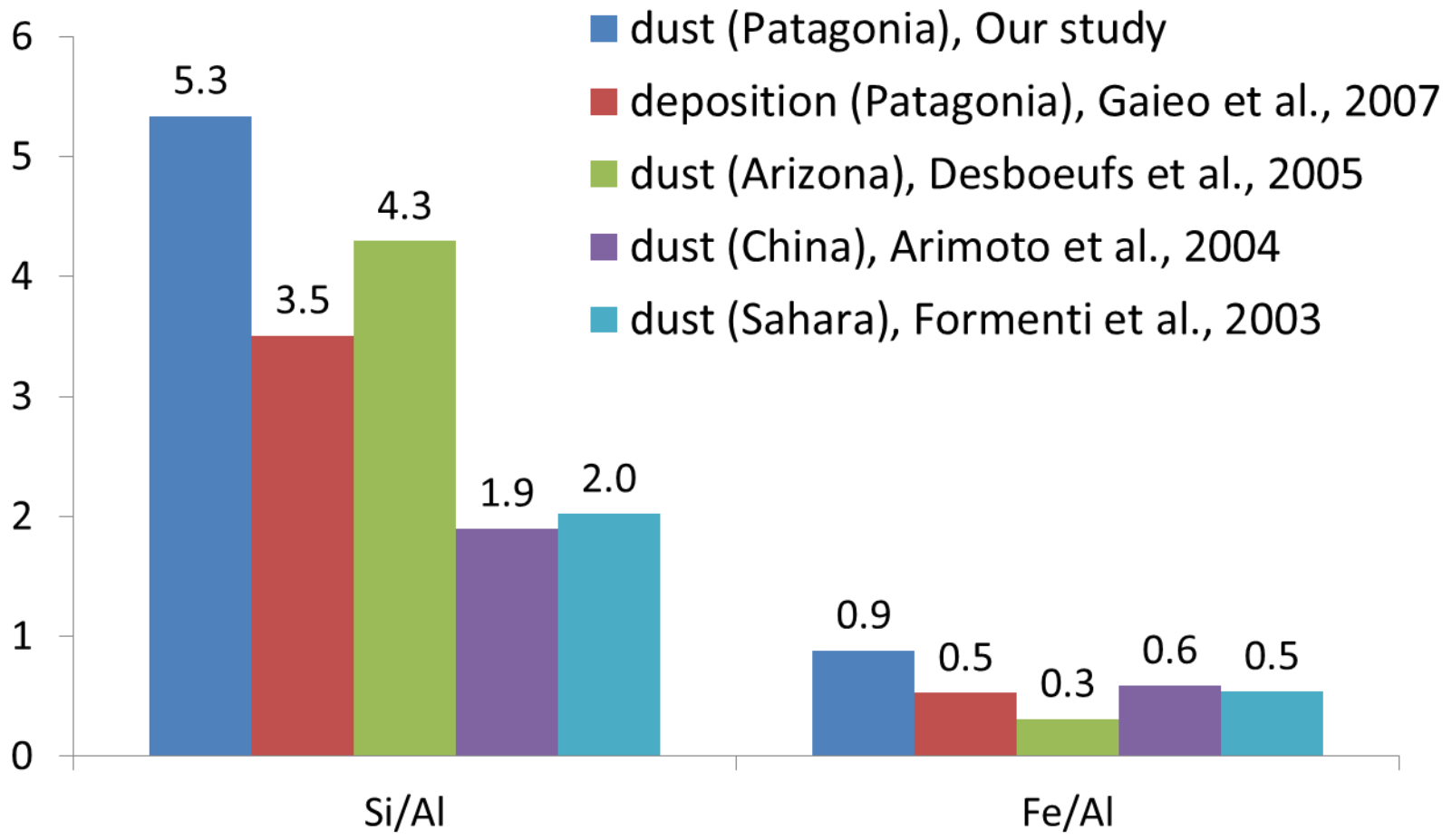


Average dust composition

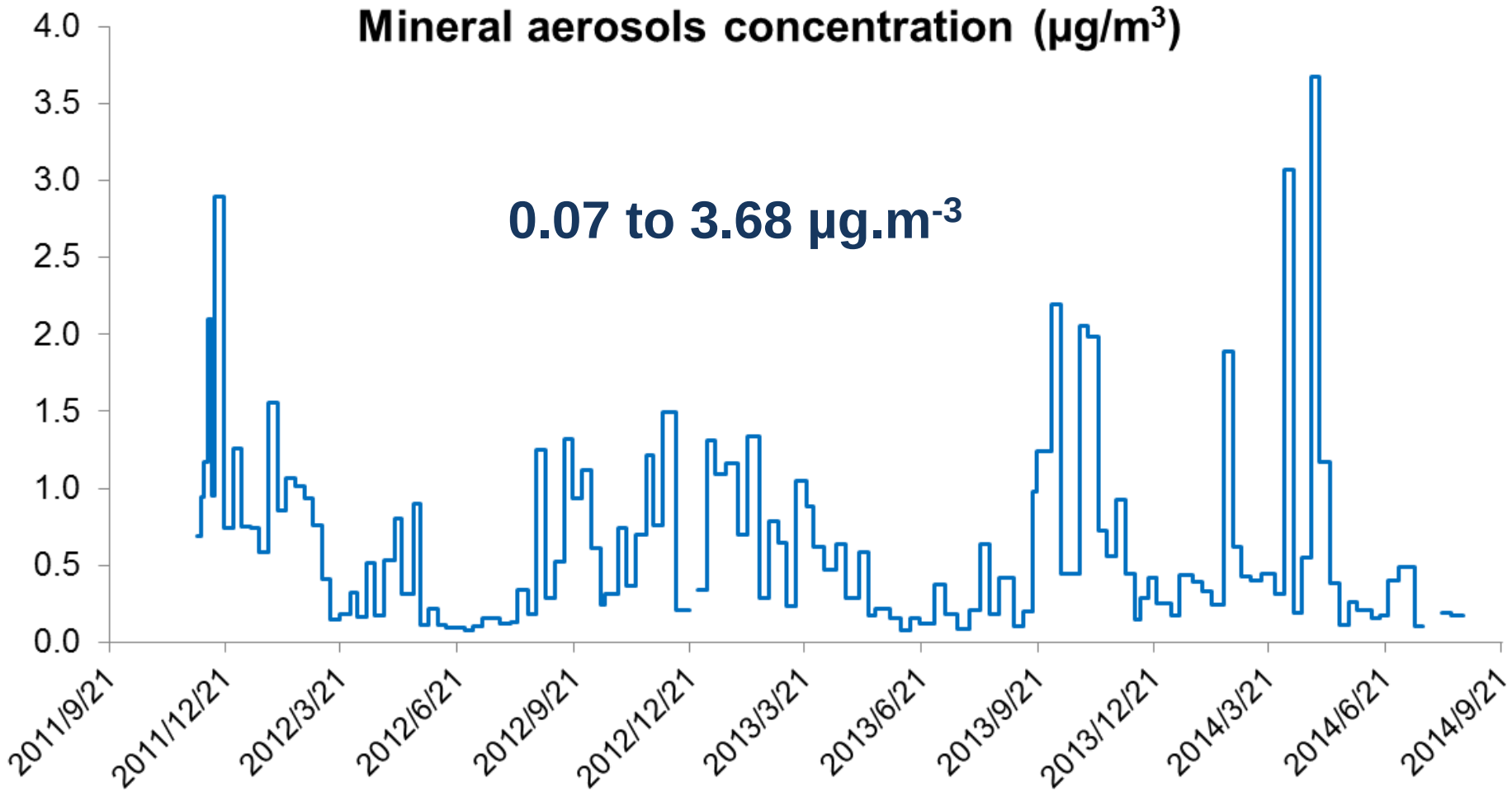
Assumption:
Sum of Al, Si and Fe oxide (Al_2O_3, SiO_2, Fe_2O_3) mass = 86%



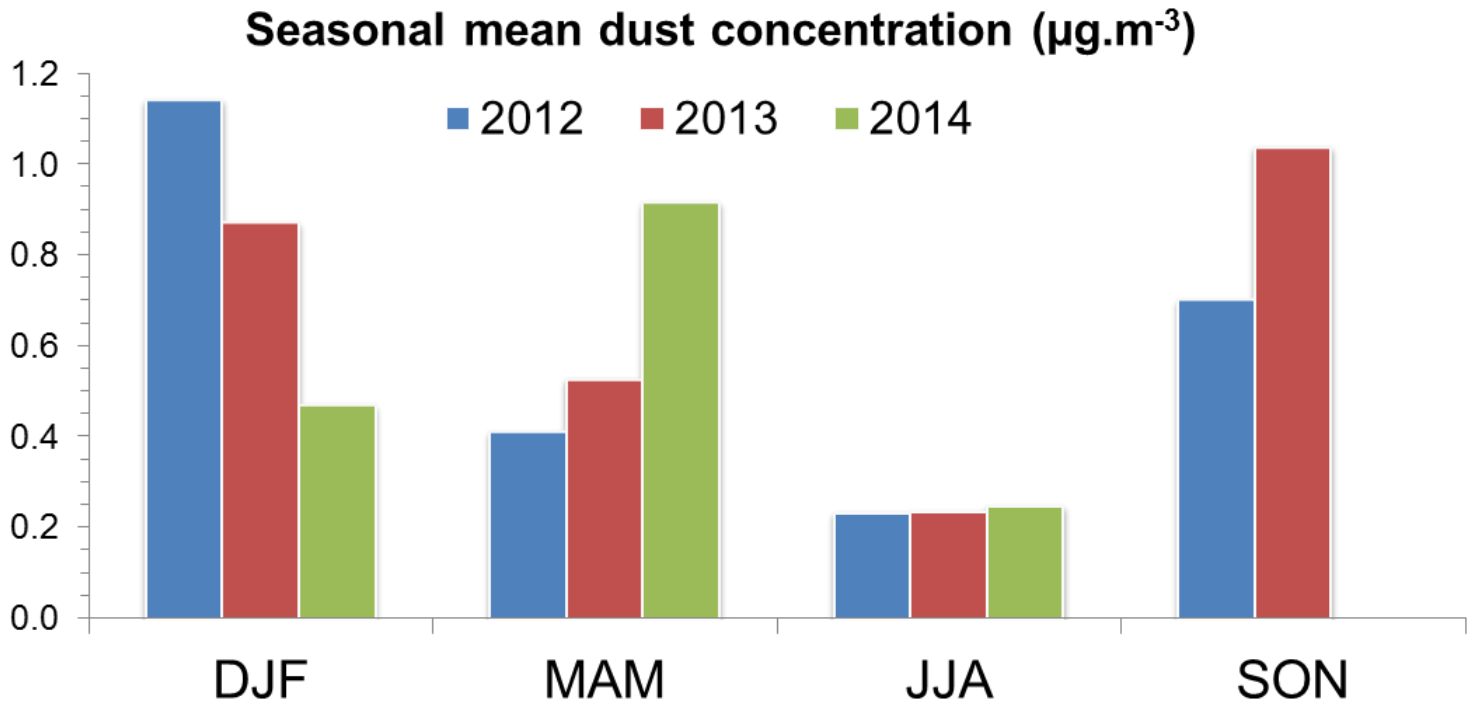
Elemental ratio to Al



temporal variations of dust concentration at Rio Gallegos



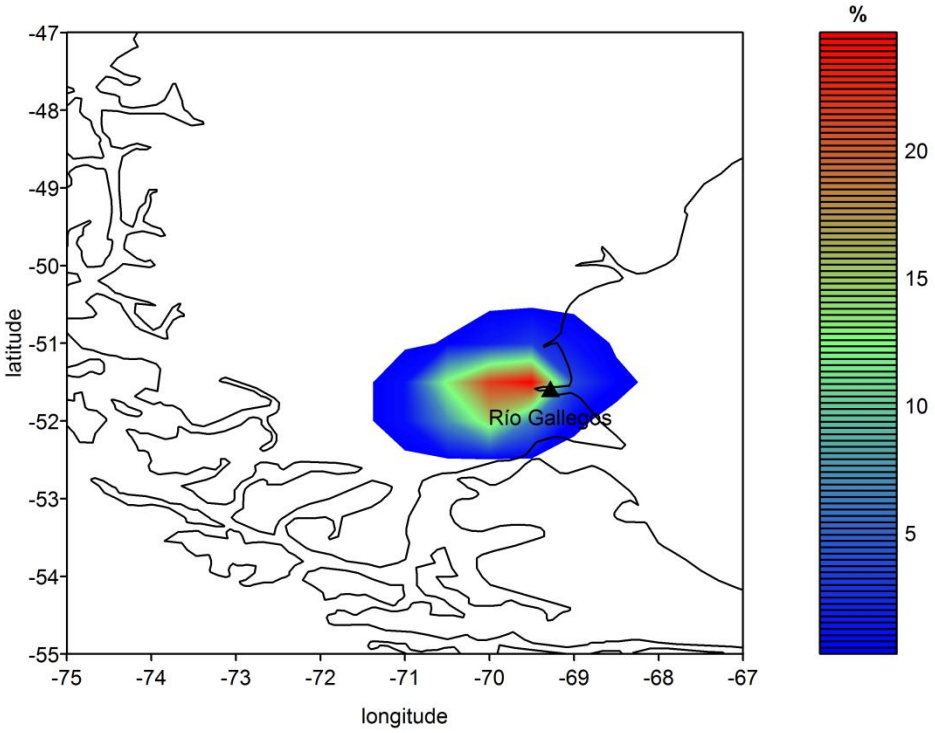
Seasonal variability of Si (µg.m^{-3})



Seasonal variability

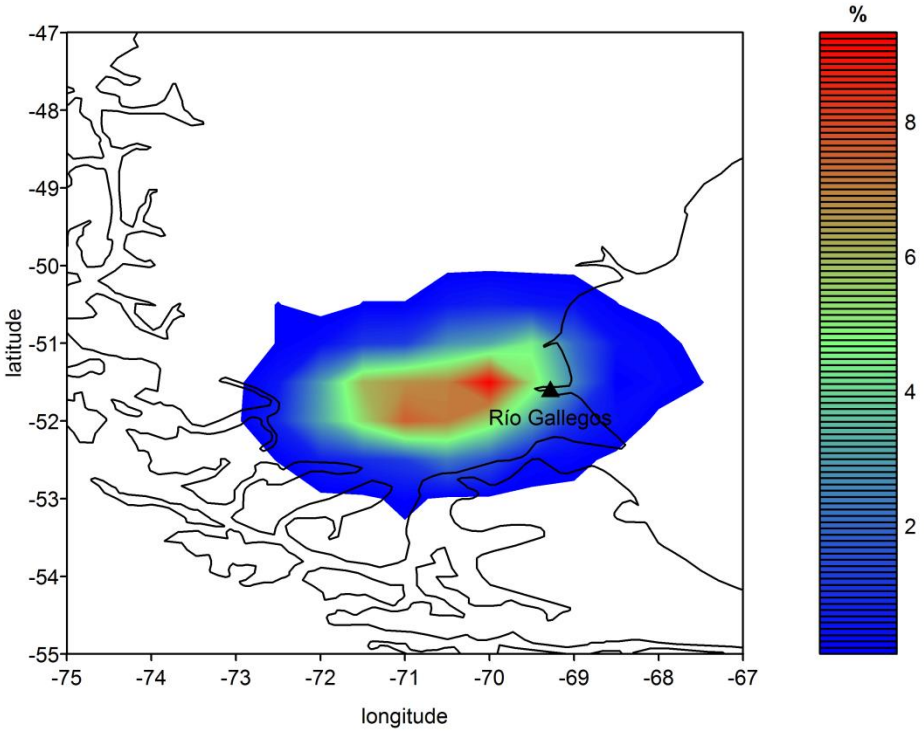
Wind or other mechanism?

HYSPLIT model backtrajectories



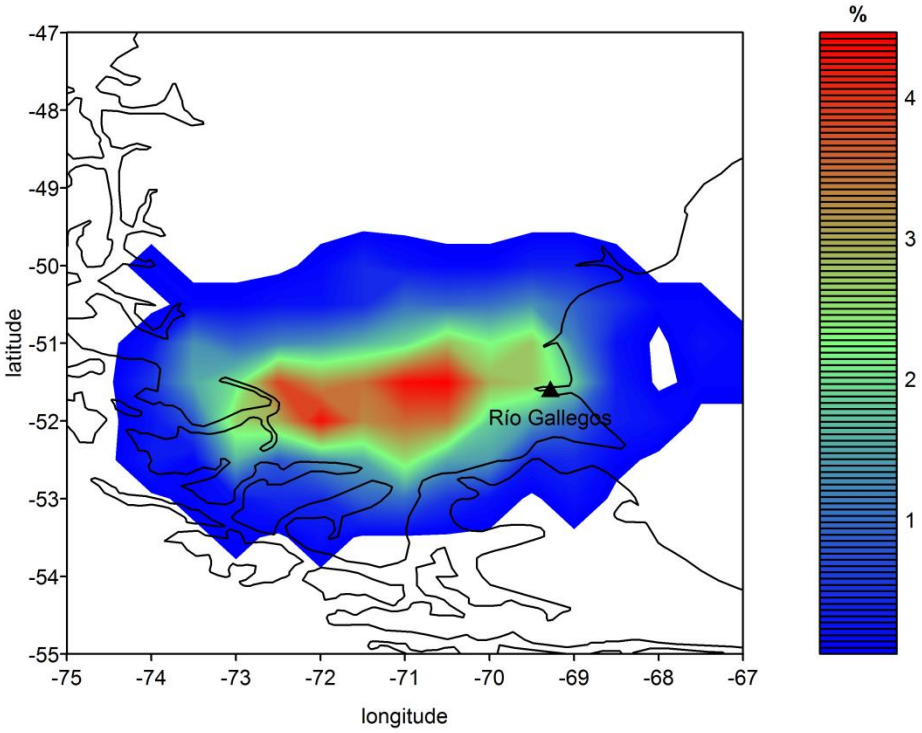
Distribution of air mass footprint
1 hour
before the arrival at sampling station

HYSPLIT model backtrajectories



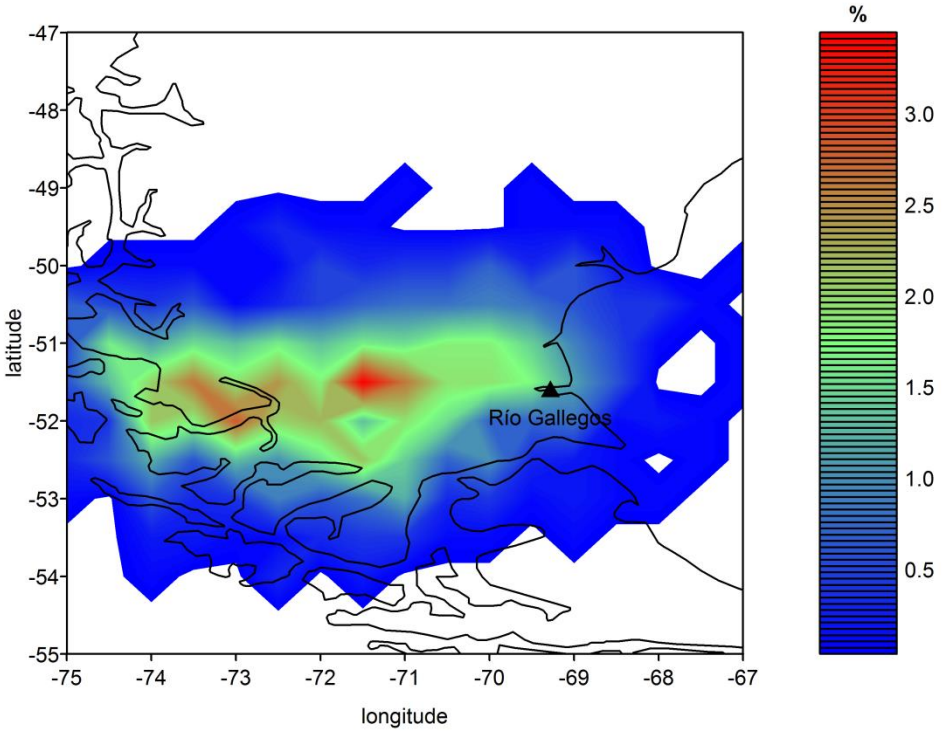
Distribution of air mass footprint
2 hours
before the arrival at sampling station

HYSPLIT model backtrajectories



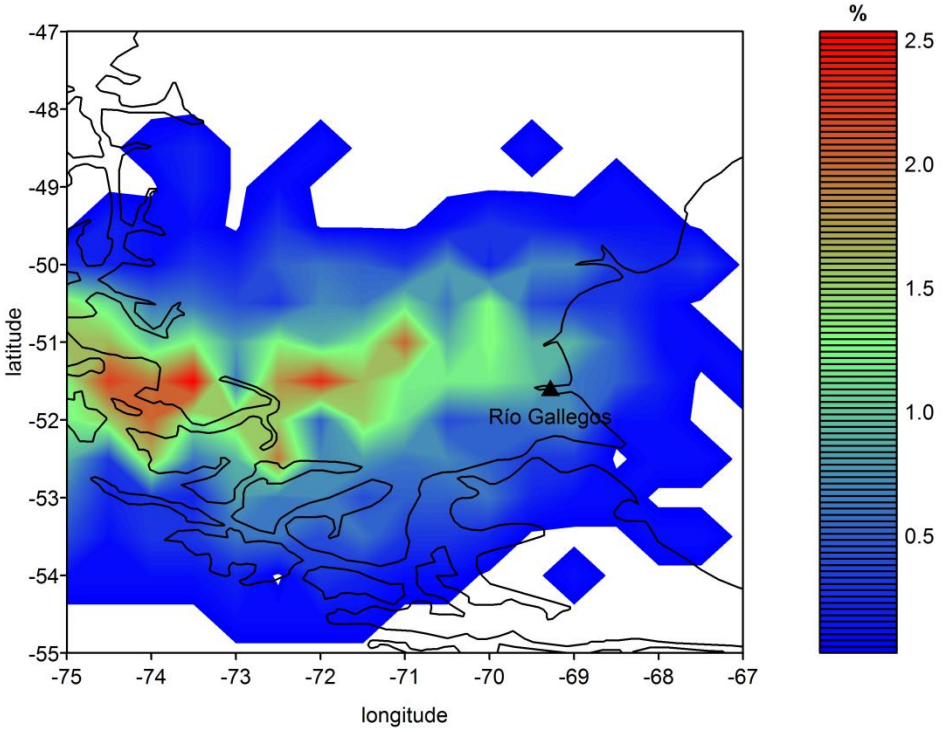
Distribution of air mass footprint
3 hours
before the arrival at sampling station

HYSPLIT model backtrajectories



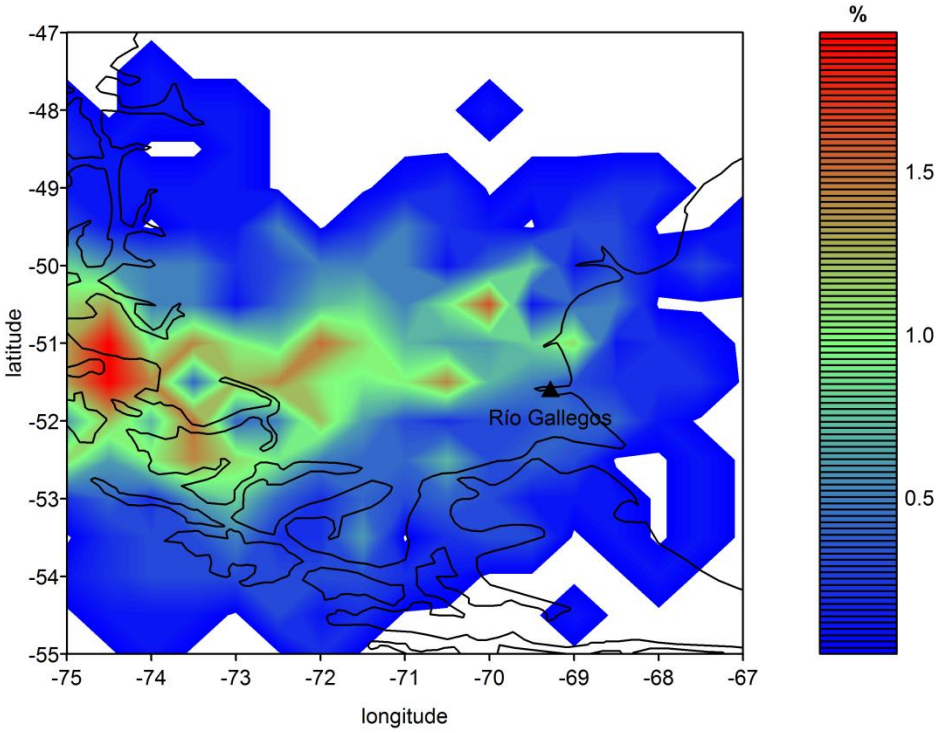
Distribution of air mass footprint
4 hours
before the arrival at sampling station

HYSPLIT model backtrajectories



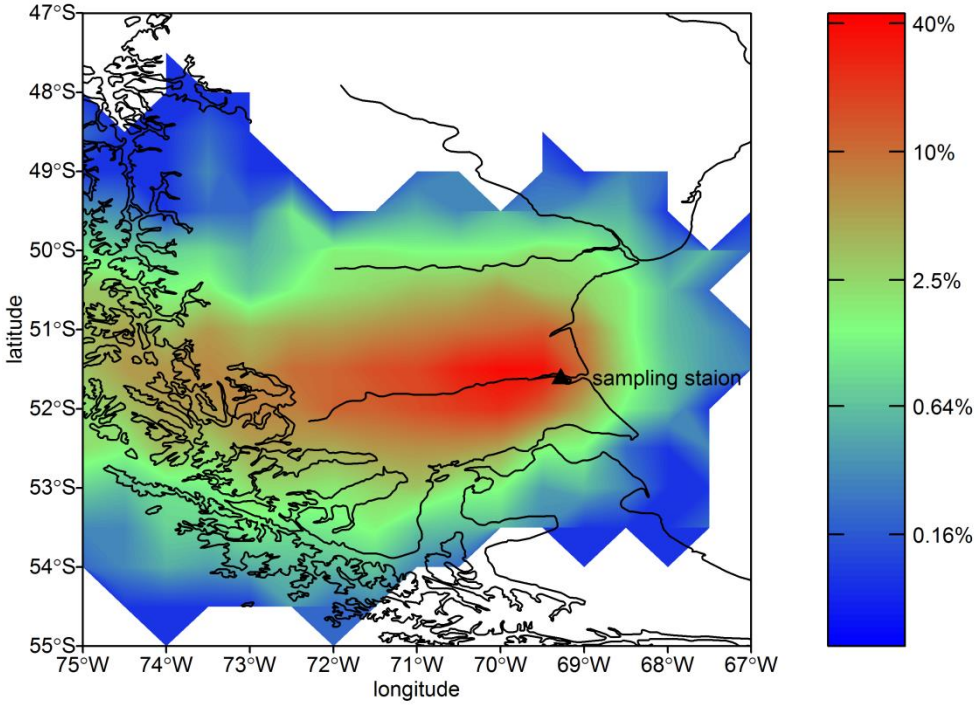
Distribution of air mass footprint
5 hours
before the arrival at sampling station

HYSPLIT model backtrajectories



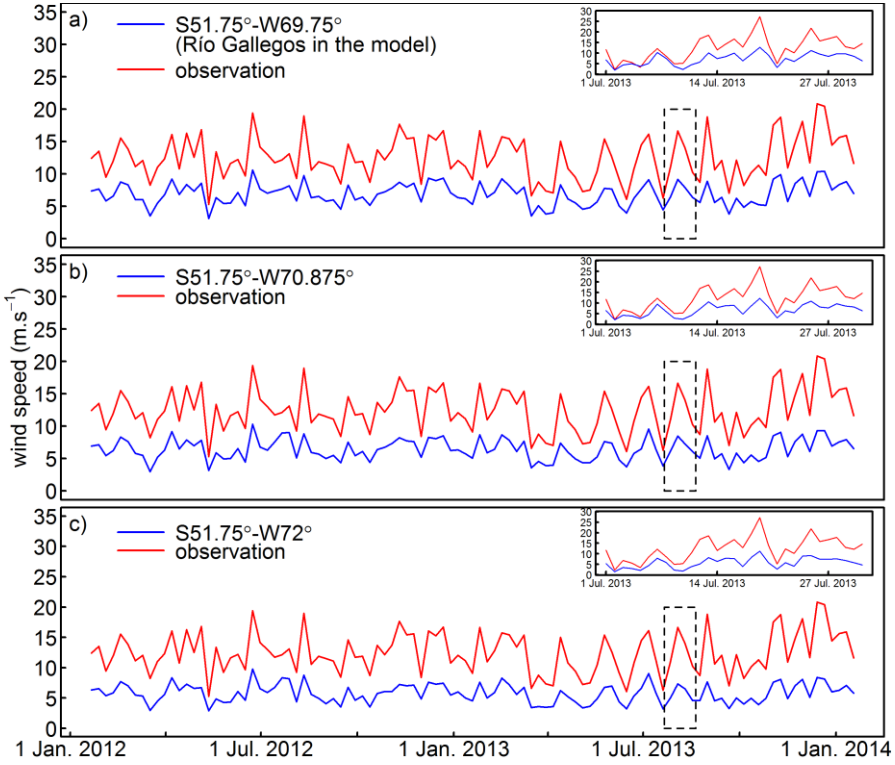
Distribution of air mass footprint
6 hours
before the arrival at sampling station

HYSPLIT model backtrajectories

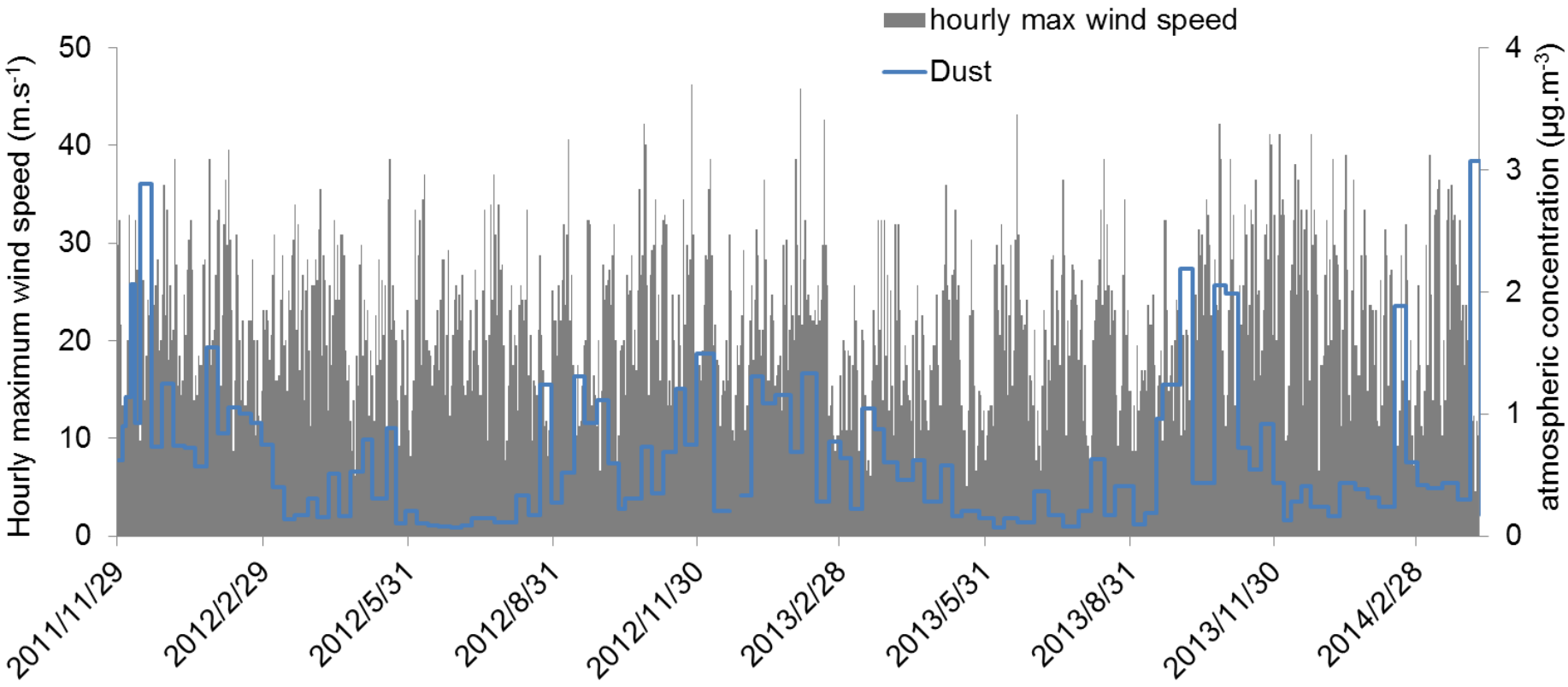


Accumulative distribution of air mass footprint
during 6 hours
before the arrival at sampling station

Measured wind and modelled wind

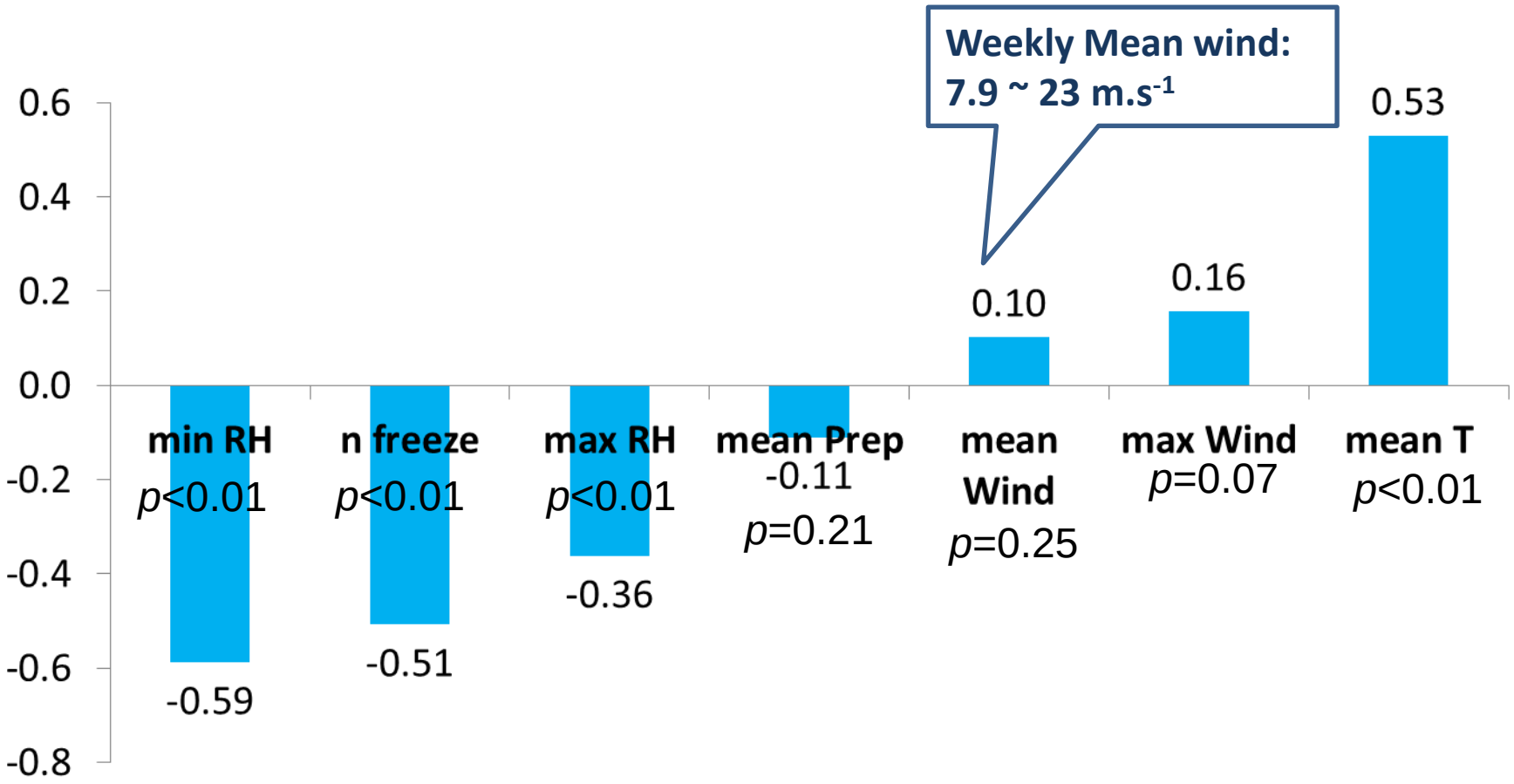


Wind and dust



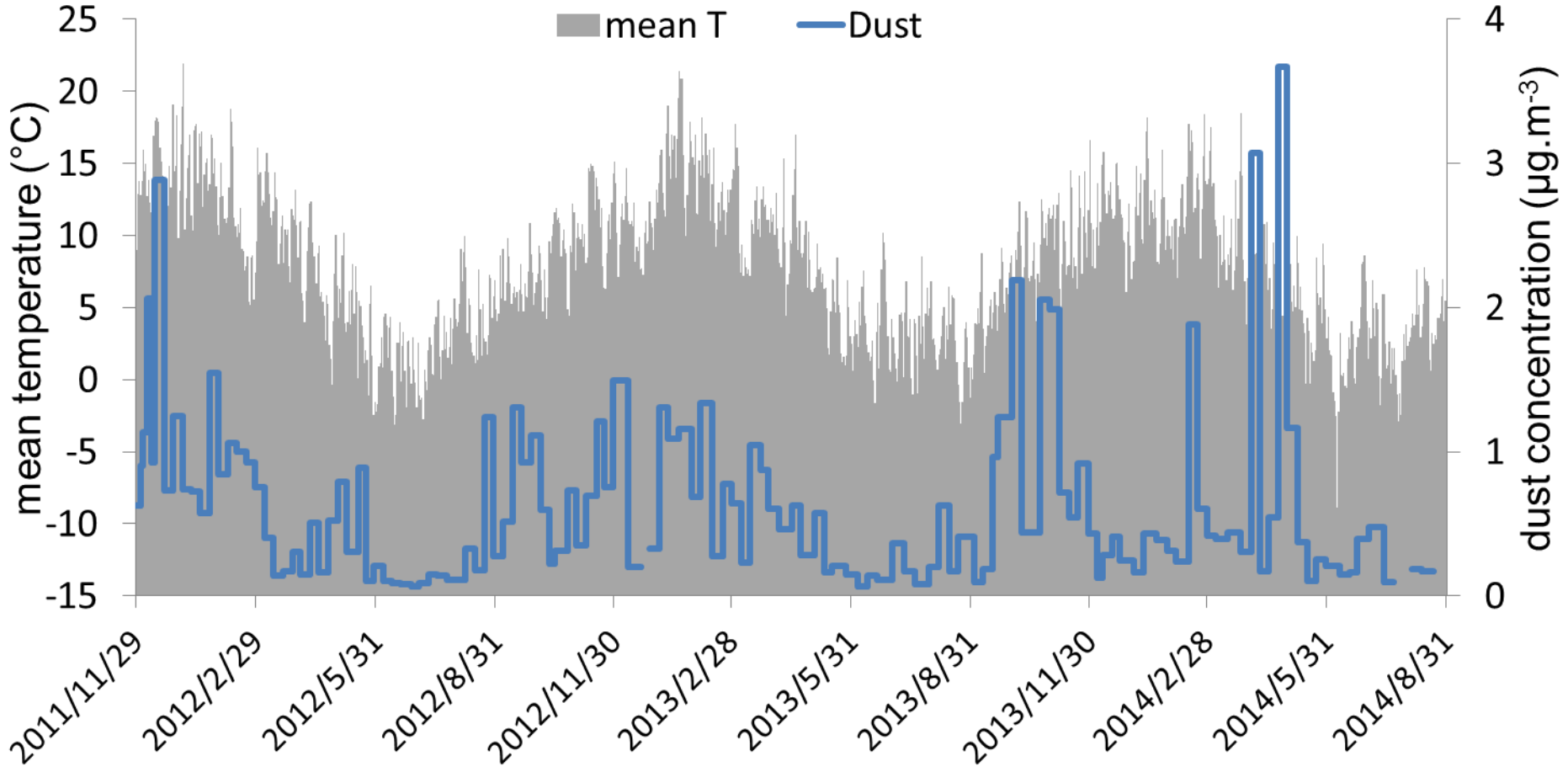
Dust concentration remained at low level even the wind speeds were high

Spearman's Correlations among dust concentration and meteorological data

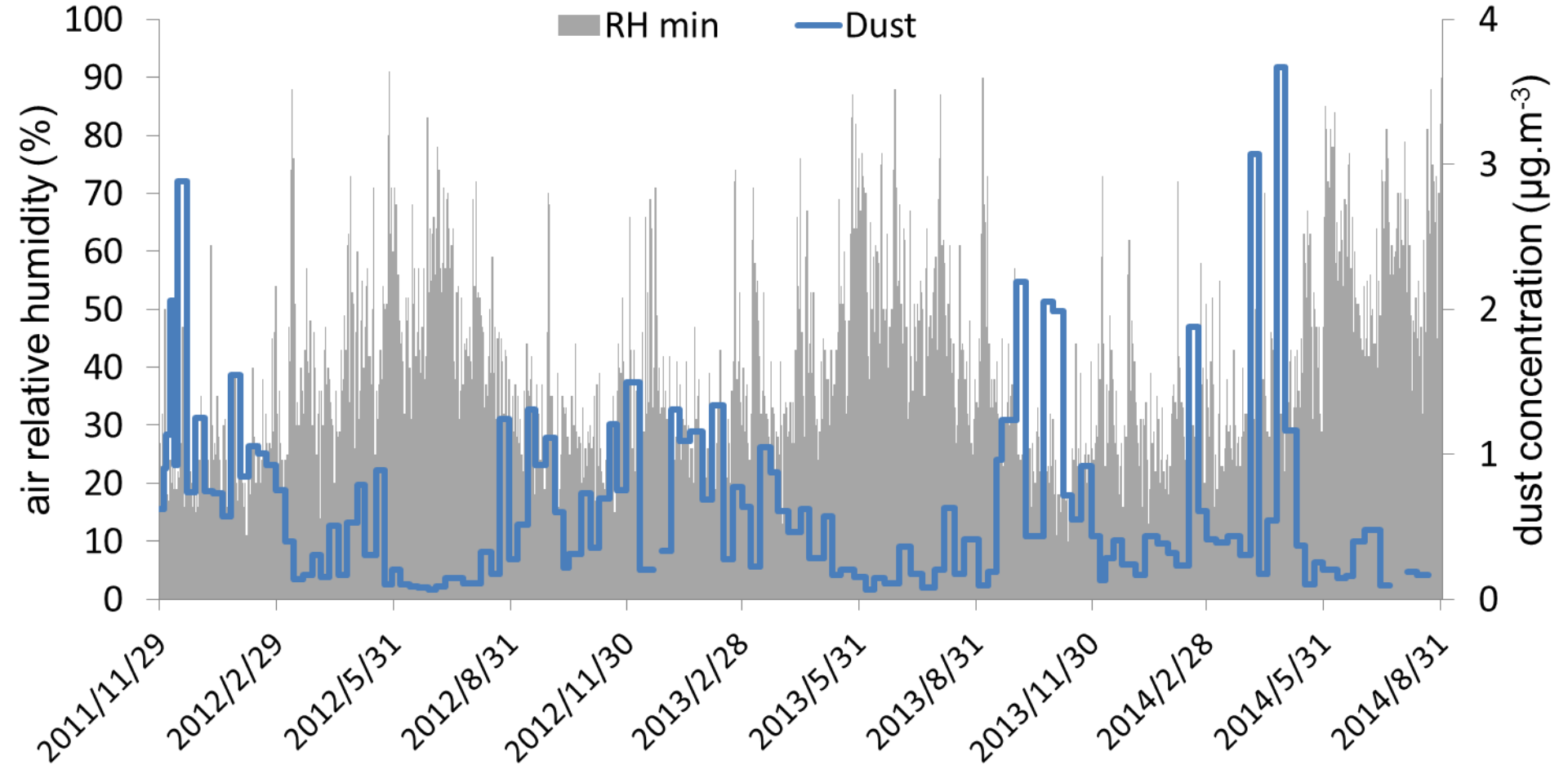


All correlations are significant at the 0.05 level

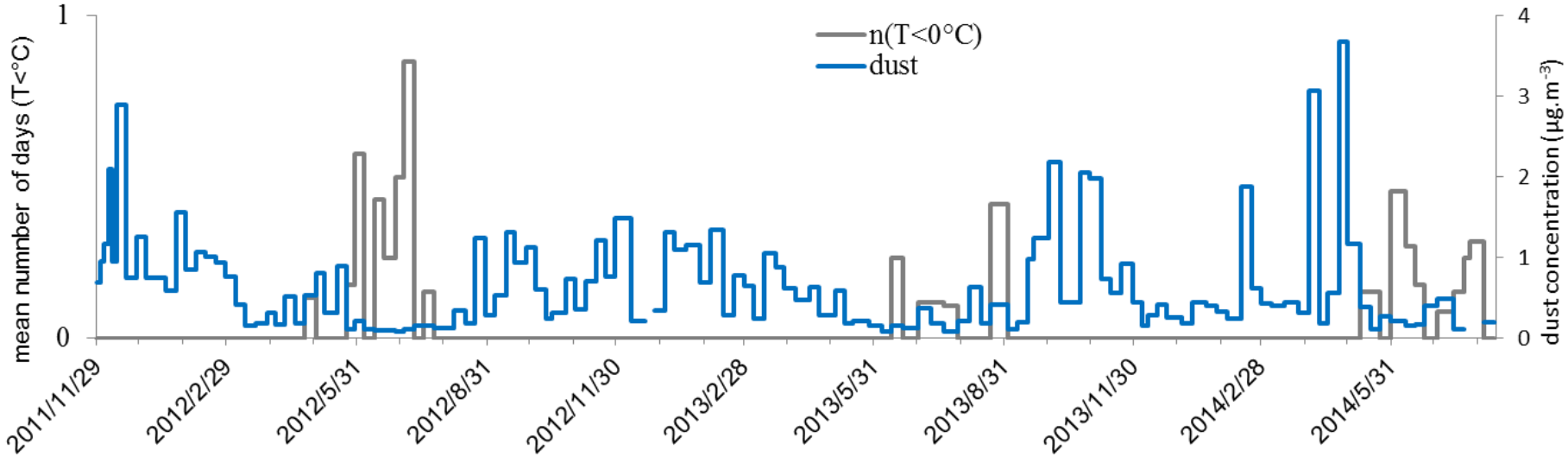
temporal variations of dust concentration at Rio Gallegos



temporal variations of dust concentration at Rio Gallegos



temporal variations of dust concentration at Rio Gallegos



Land freezing or snow cover might be responsible for the continuous low concentration in winter

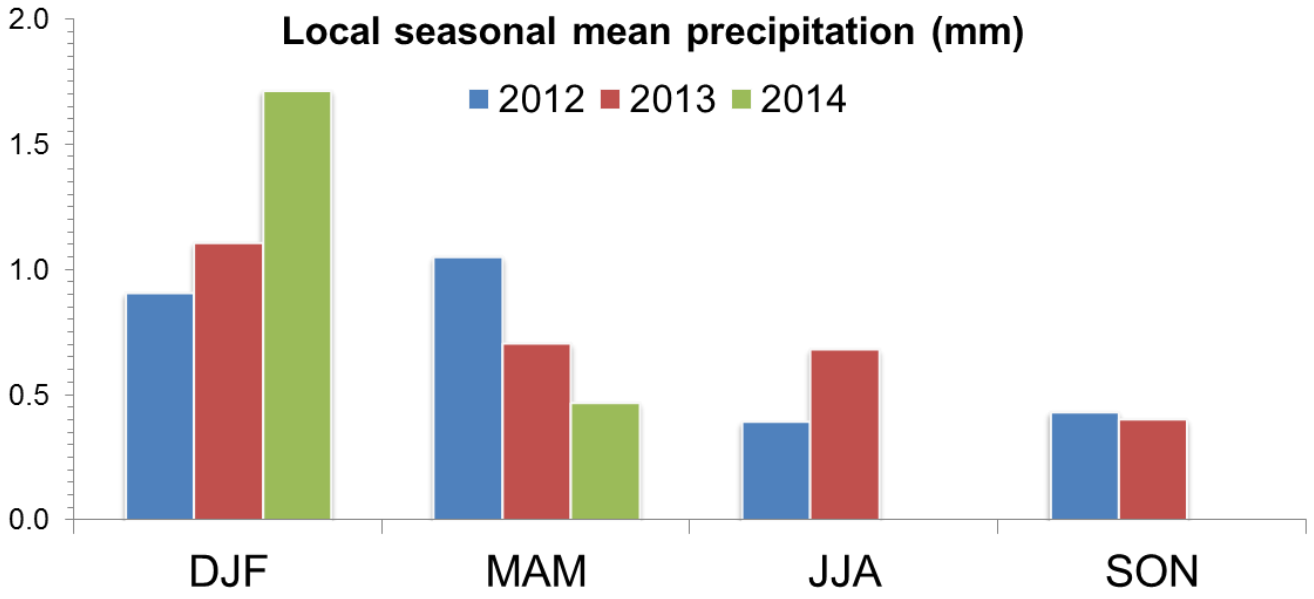
Conclusion

Conclusions

- **Dust concentration and composition**
  - Weekly average mineral dust concentrations in Río Gallegos vary from 0.07 to 3.68 $\mu g.m^{-3}$;
  - Patagonian dust is relatively enriched in Si and Fe.

- **Temporal patterns of dust emission**
  - Higher concentration in summer, lower concentration in winter;
  - Seasonal variation is associated to the temperature and air relative humidity
  - Much lower dust concentration in winter due to the land frozen;

Thank you for your attention!



local precipitation might be responsible for the inter-annual variation.