

Introduction

An overview on one year particle sampling at the Cape Verde Atmospheric Observatory (CVAO) is presented. Digital high-volume filter-samples, collected continuously throughout the year, give a summary of the distribution of the annual mass-concentration. The winter months January until March and November, December turned out to have the highest mass-concentrations, whereas from June to October the concentrations are low. During 2 intensive campaigns, additional size-resolved particle samples from a 5-stage BERNER-impactor were taken. The samples were analysed for ions, OC/EC, sugars and the metal fraction to determine the composition of the marine aerosol and Saharan dust. Possible anthropogenic influences on the chemical composition of the long-range transported particles are discussed and the frequency of dust events is estimated.

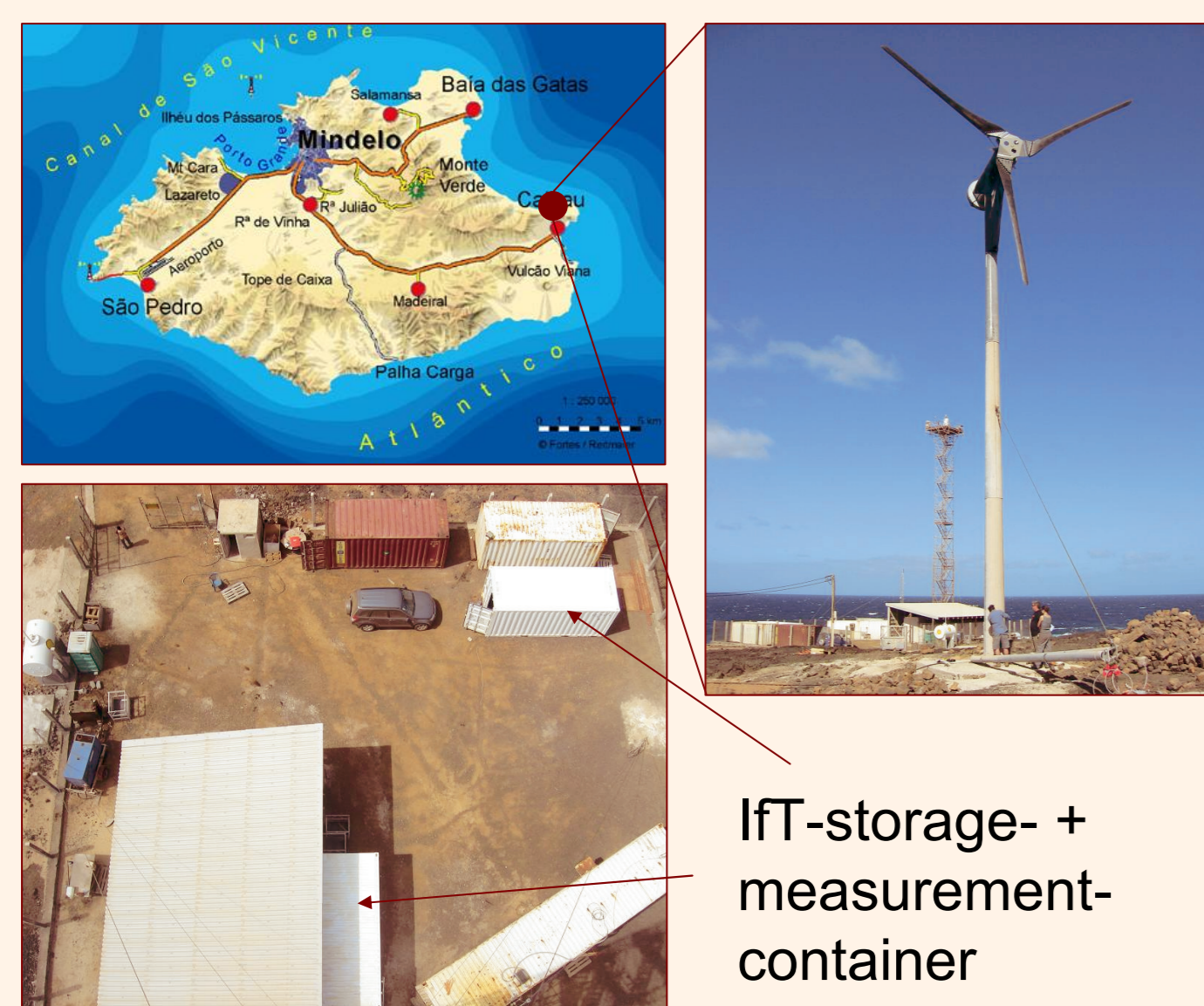


Fig. 1: Atmospheric observatory with 30 m-tower and new wind-turbine, container positions ~ 100 m onshore, 95 % north-easterly trade winds, average annual temperature: 25 °C, prec.: 50 mm



Fig. 2: DIGITEL high volume sampler (left) with PM₁₀-inlet, 500 l min⁻¹, 150 mm quartz fibre filters (Munktell MK 360); BERNER 5-stages impactor (right), 75 l min⁻¹, collecting on aluminium and Nuclepore[®] foil, stages lower cut-offs: 0.05 - 0.14 - 0.42 - 1.2 - 3.5 µm

Results

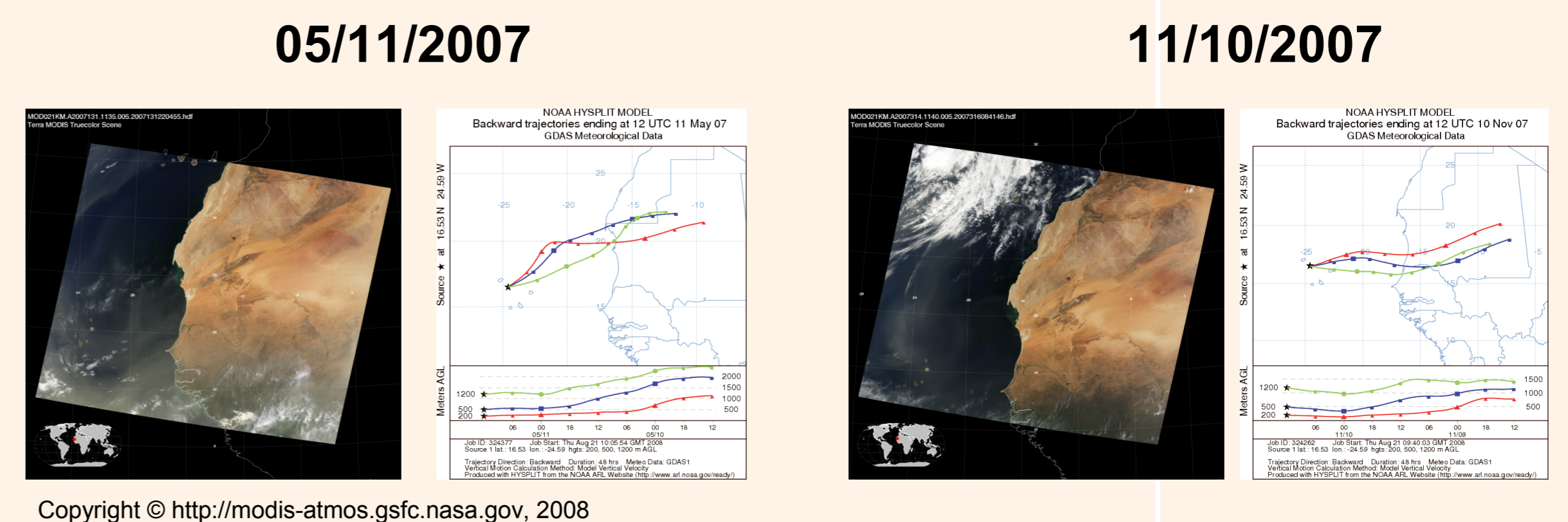


Fig. 3: Satellite images (MODIS) and backward trajectories (Hysplit) for two dust events

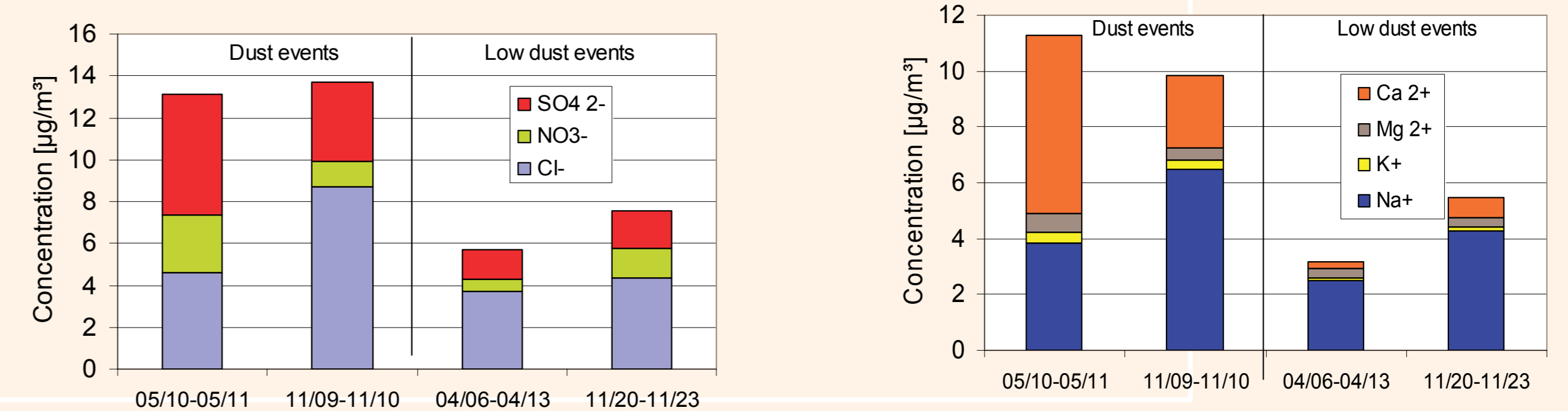


Fig. 4: Anorganic ions of DIGITEL filter samples during dust and low dust events

Tab. 1: Total mass concentration as average amounts of 5 samples for dust events and 5 for low dust events from BERNER impactor

	Total mass concentration	Dust events	Low dust events
		[µg/m ³]	[µg/m ³]
Stage 1	0,05 - 0,14 µm	0.431	0.115
Stage 2	0,14 - 0,42 µm	2.344	1.047
Stage 3	0,42 - 1,2 µm	10.208	0.976
Stage 4	1,2 - 3,5 µm	45.217	3.669
Stage 5	3,5 - 10 µm	31.482	3.412
Sum		89.682	9.219

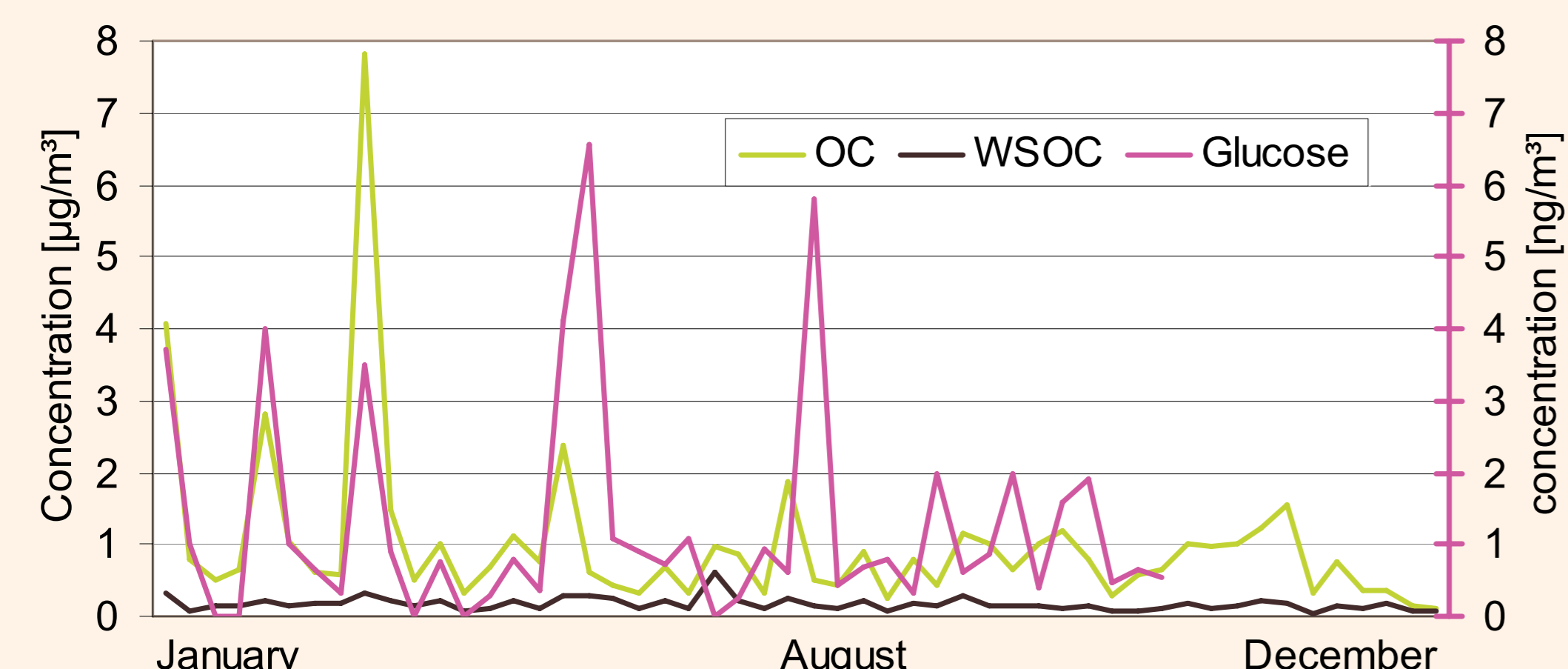
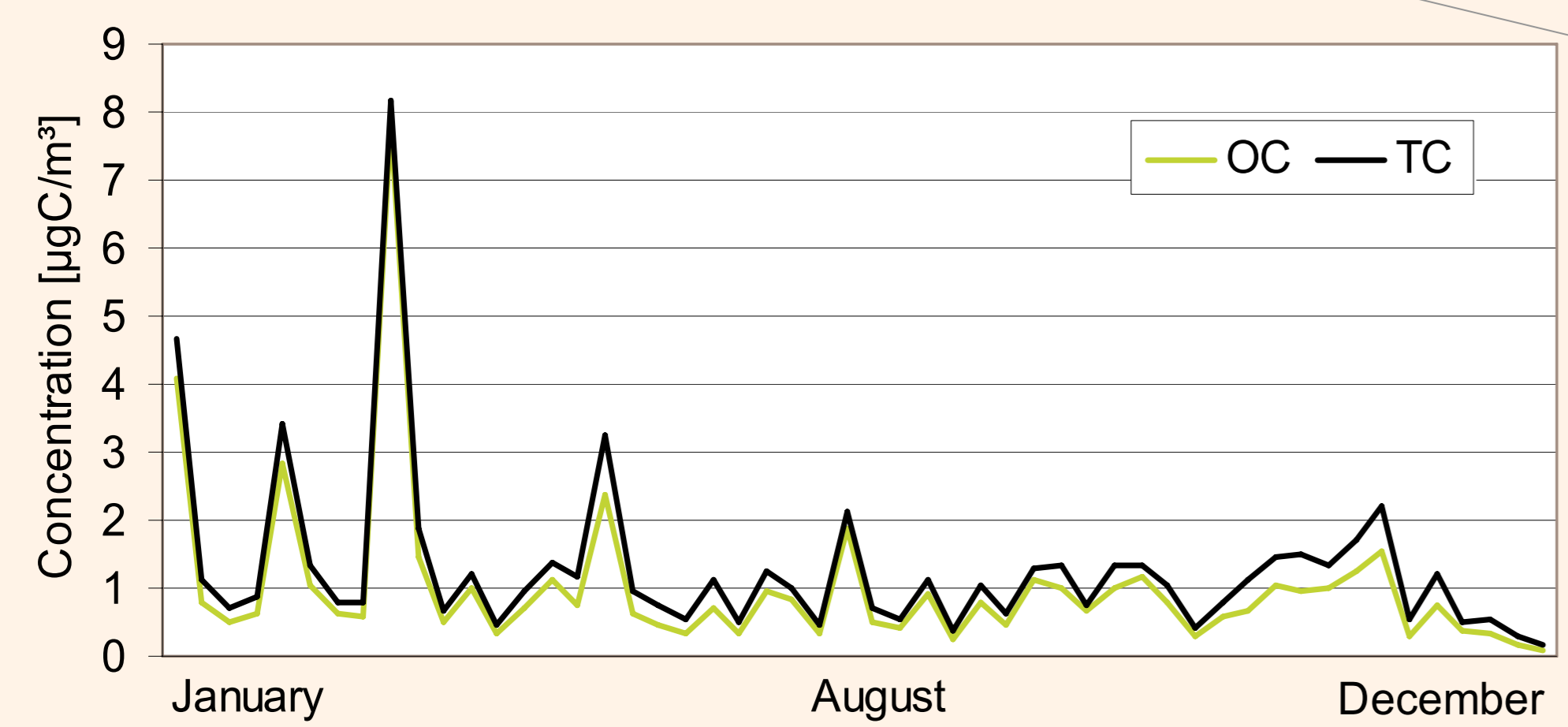
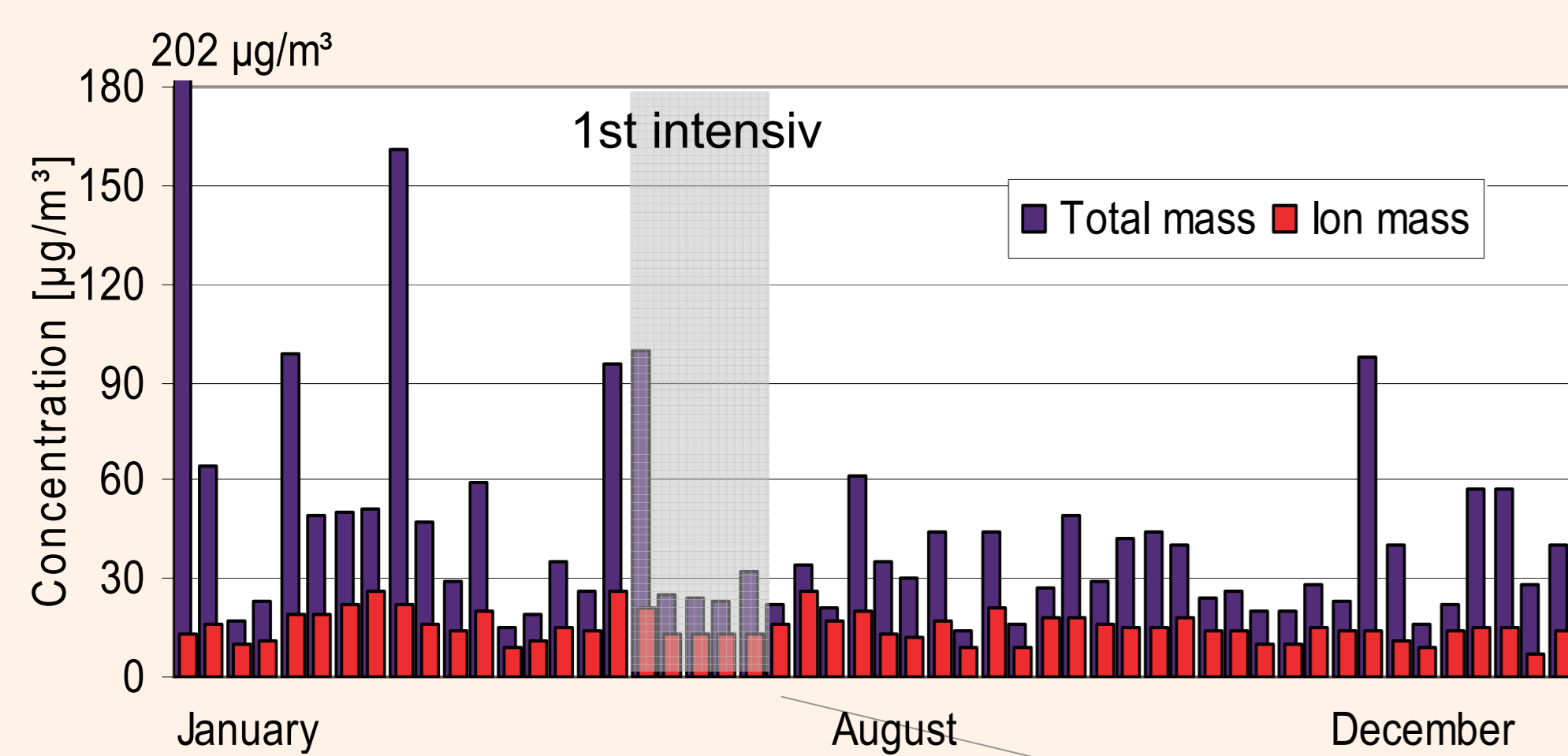


Fig. 5: Weekly averages of total and ion mass, organic carbon (OC) and total carbon (TC), water soluble carbon (WSOC), Glucose from DIGITEL samples

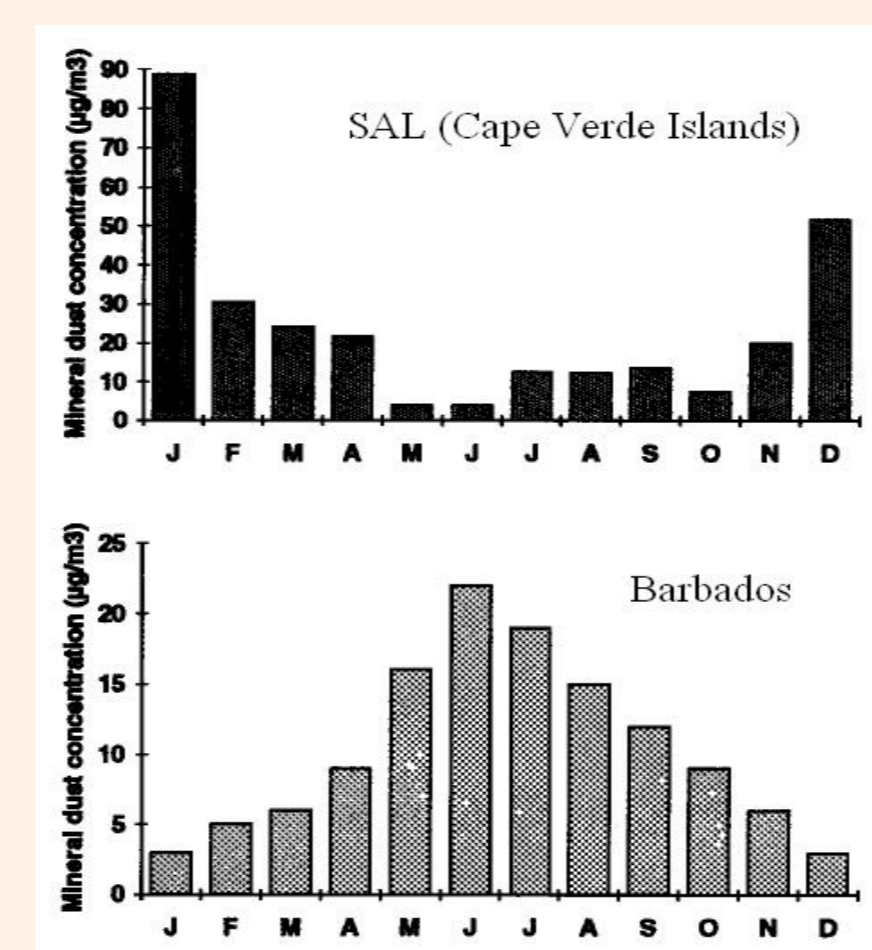


Fig. 6: Dust concentration [µg m⁻³] after Chiapello et al. (1995)

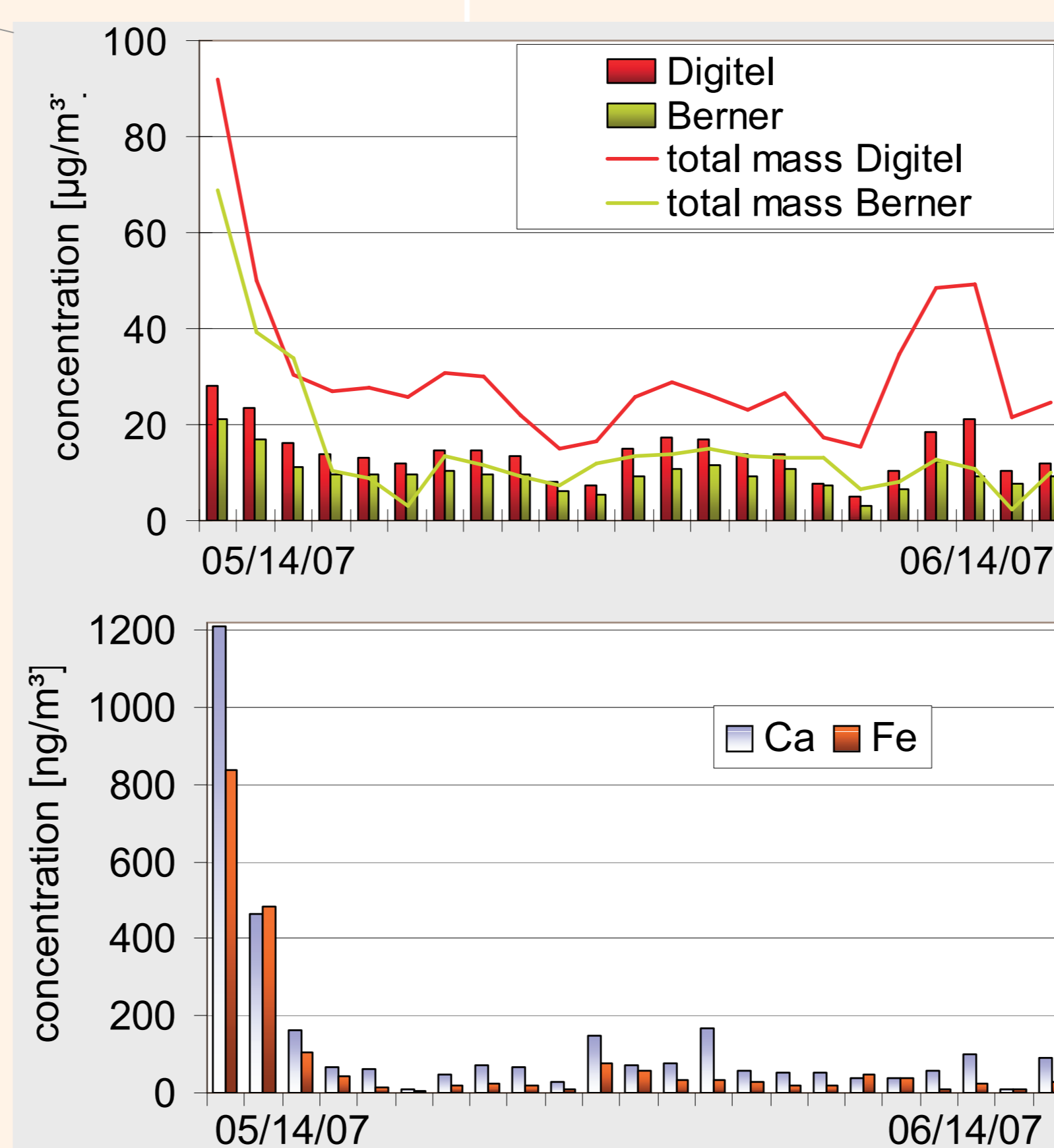


Fig. 7: Mass- and ion-concentrations of Berner- and Digital-samples, Ca- and Fe-conc. of Berner-samples during 1st intensive campaign

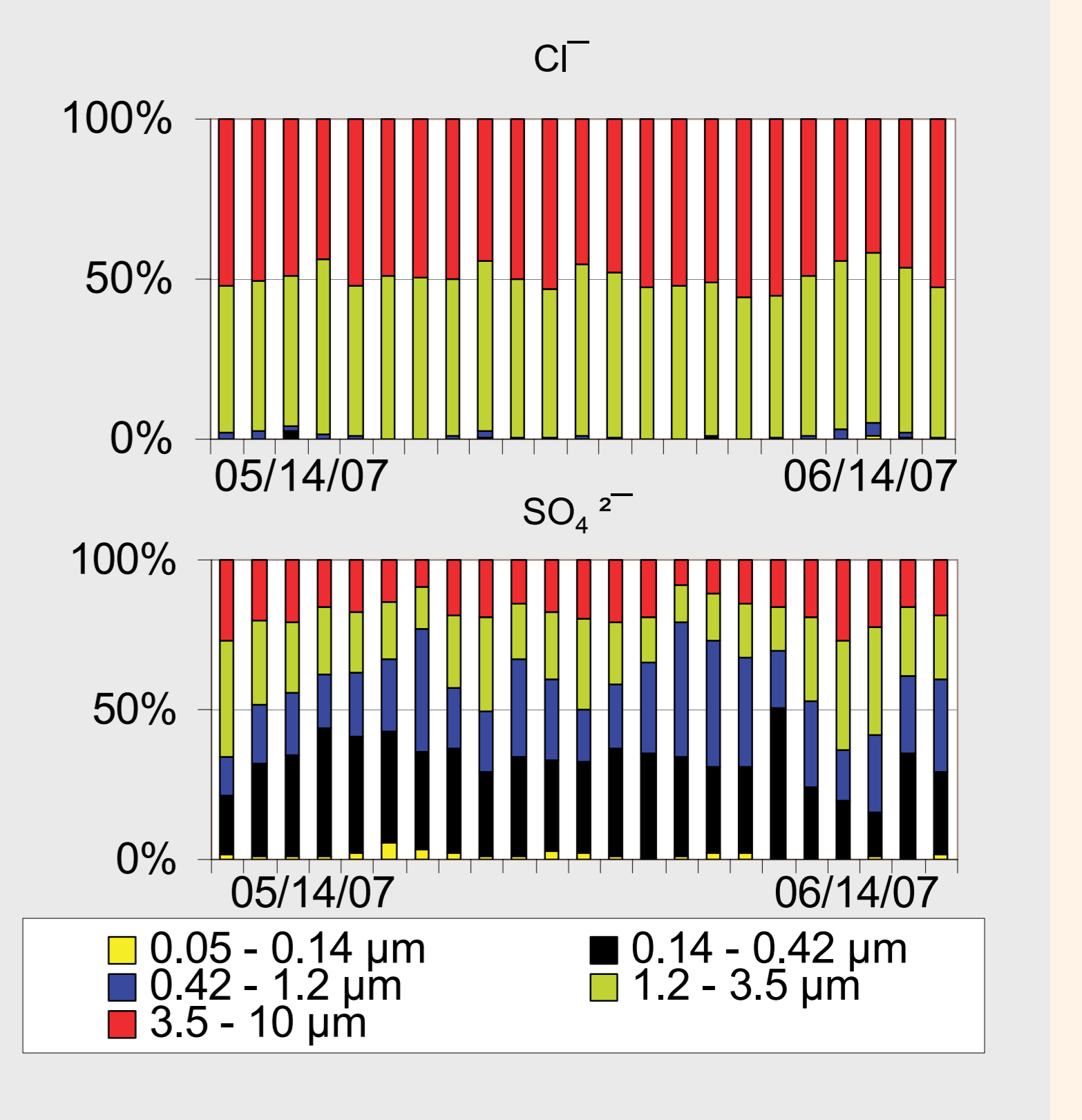


Fig. 8: Chloride and sulfate distributions in size-segregated Berner-samples during 1st intensive campaign

Summary

The results of the particle analysis show a distinction between dust and low dust events. Dust events are indicated by high loading of total mass compared to ion mass, accompanied by increased amounts of organic carbon and glucose (Fig. 5, 7), supported by satellite and trajectory images (Fig. 3). The higher concentrations of SO₄²⁻ and NO₃⁻ indicate long range transport, the high Ca²⁺ is of mineral origin (Fig. 4). The difference between high and low dust can also be seen in the total mass concentration in the 3 upper stages of the BERNER impactor (Tab. 1). As expected ions from sea salt like Cl⁻ is found only in the bigger stages of the Berner-impactor, whereas SO₄²⁻ is also seen in the smaller stages as nss- SO₄²⁻.

Acknowledgement

This work was supported by the BMBF within the SOPRAN project under contract FKZ 03F0462J

References

Chiapello, I., Bergametti, G., Gomes, L., Chatenet, B., *Geophysical Research Letters*, 1995, 22, 3191.