3. weekly report SO 259-3

After passing the Canary Island the RV Sonne deployed the first ARGO float, as illustrated in Figure 1.

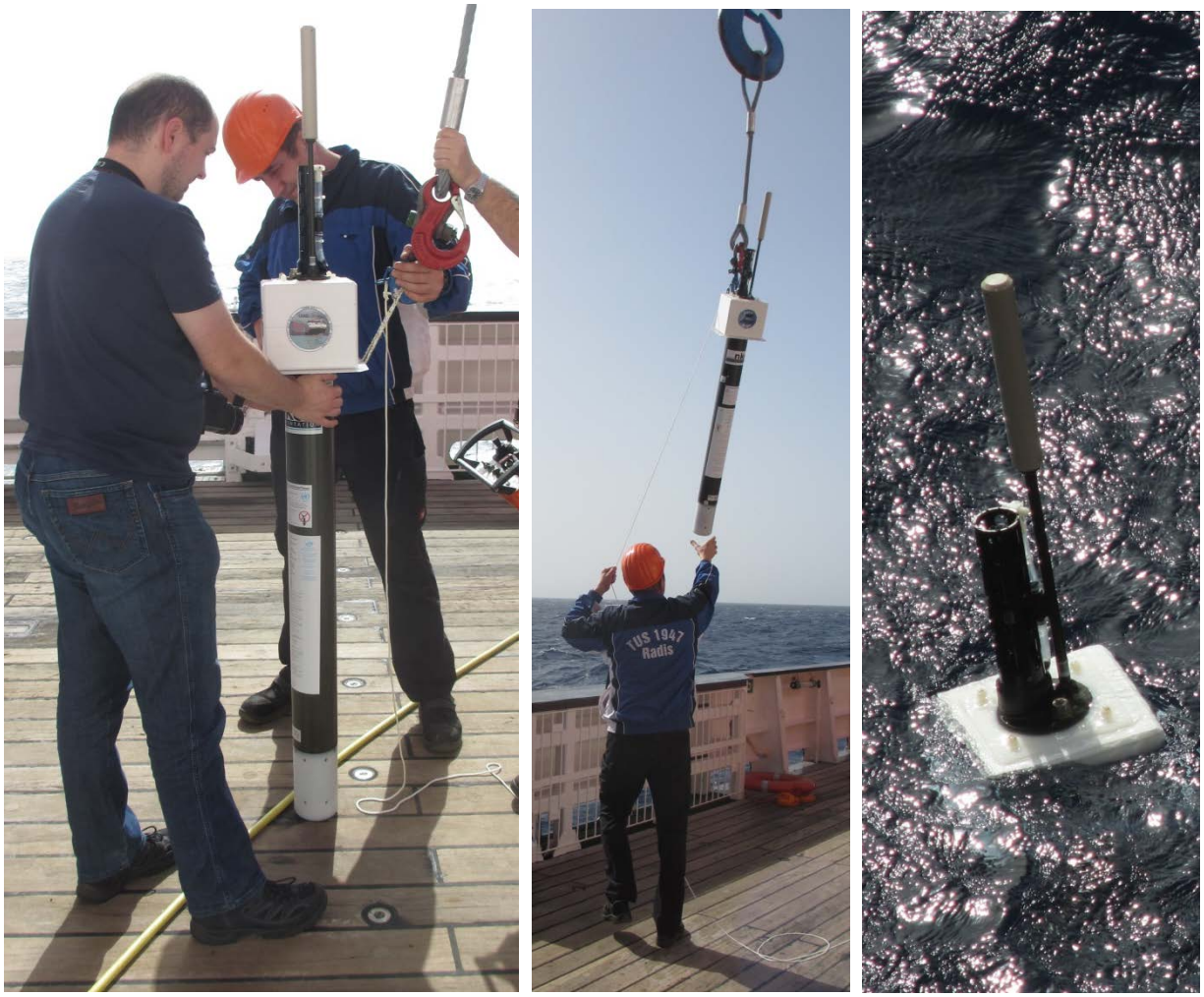

Figure 1 *deployment of the first ARGO floats (near 20W/25N) on Christmas Day 2017*

That was the last day of good visibility as we entered and stayed with a massive stand-storm from the Sahara for the next four days (Dec26 to Dec29) with visibilities down to a mile, as illustrated in Figure 2. On those days a yellow sun-disk with an increased glow rose and set well above the horizon, with a moon like low intensity. Also the sky background had changed to a grey color, which made it also more difficult to detect low latitude clouds. All the color changes to sky and sun were indicators of mineral dust aerosol, with were confirmed by strong dust depositions to the decks of the ship.

Sun-photometer data from Dec 24 to Dec 29 for column aerosol loading (AOD at 550nm) and for aerosol particle size (through the solar spectral AOD dependence - expressed by the Angstrom parameter) of Figure 3 illustrate this extraordinary strong and long-lasting dust event.

Figure 2 *Visibility from the piledeck (above the bridge) of the RV Sonne during the dust event (note, this is no fog) on Dec 28 (left) compared to the visibility before the dust event on Dec 25 (right).*

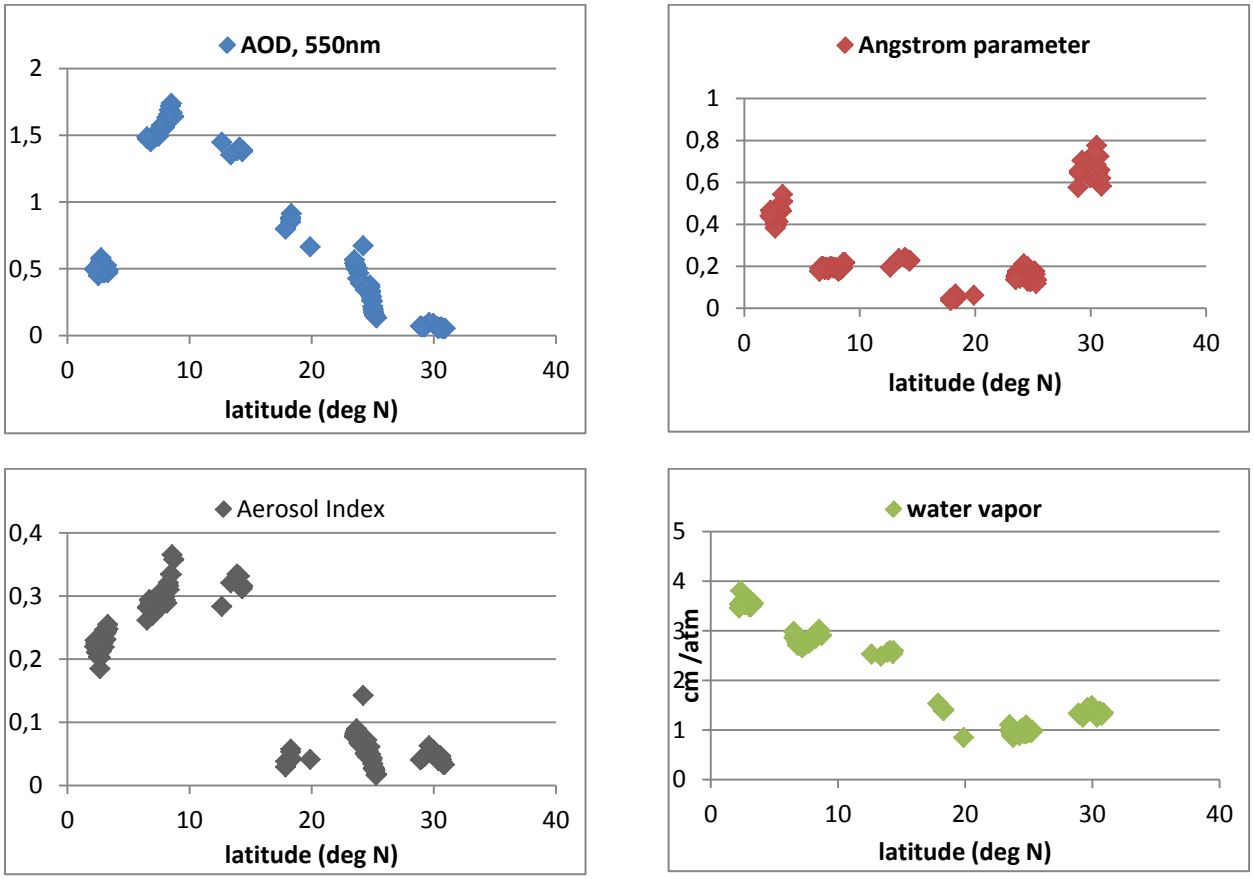

Figure 3 *Properties of atmospheric aerosol und water vapor as detected by sun-photometer samples from December 24 to December 29 (2017) at a longitude near 20W by RV Sonne. Shown are (1) aerosol amount (AOD at 550nm, upper left), (2) relative aerosol size (Angstrom - low values indicating relatively large super-micron aerosol sizes, upper right), (3) aerosol potential to influence water clouds (Aerosol Index [=AOD*Angstrom], lower left) and (4) water in the atmospheric column (water vapor, lower right).*

On Dec 24 (near 30deg N) the aerosol loads were near background conditions with mid-visible AOD values at and below 0.1. Then in the morning of Dec 25 the AOD started to increase and reached values near 1.5 on Dec 27 and Dec 28 between 15N and 5N. The associated Angstrom parameter of 0.2 during those days was relatively low at 0.2 indicating relatively large aerosol particles as expected for larger optical depth of mineral dust.

This dust event is a useful reference case to examine dust aerosol forecasts. Initial comparisons to the predictions of the NAAPS model (https://www.nrlmry.navy.mil/aerosol/) are presented in Figure 4. There distributions of predicted dust AOD for the eastern Atlantic from Dec 25 to Dec 29 have been extracted for 12UTC. The ship location closely followed the 20 deg meridian on those days from 25 N in latitude to the equator. Comparison to the AOD values sampled with the sun-photometer of Figure 3 indicate that the model got the dust event right, but that the model underestimated the strength of the dust event especially for the last three days. The model also suggests a rapid decline south of 5N, while the dust event even continued beyond the equator. These are just first initial impressions.

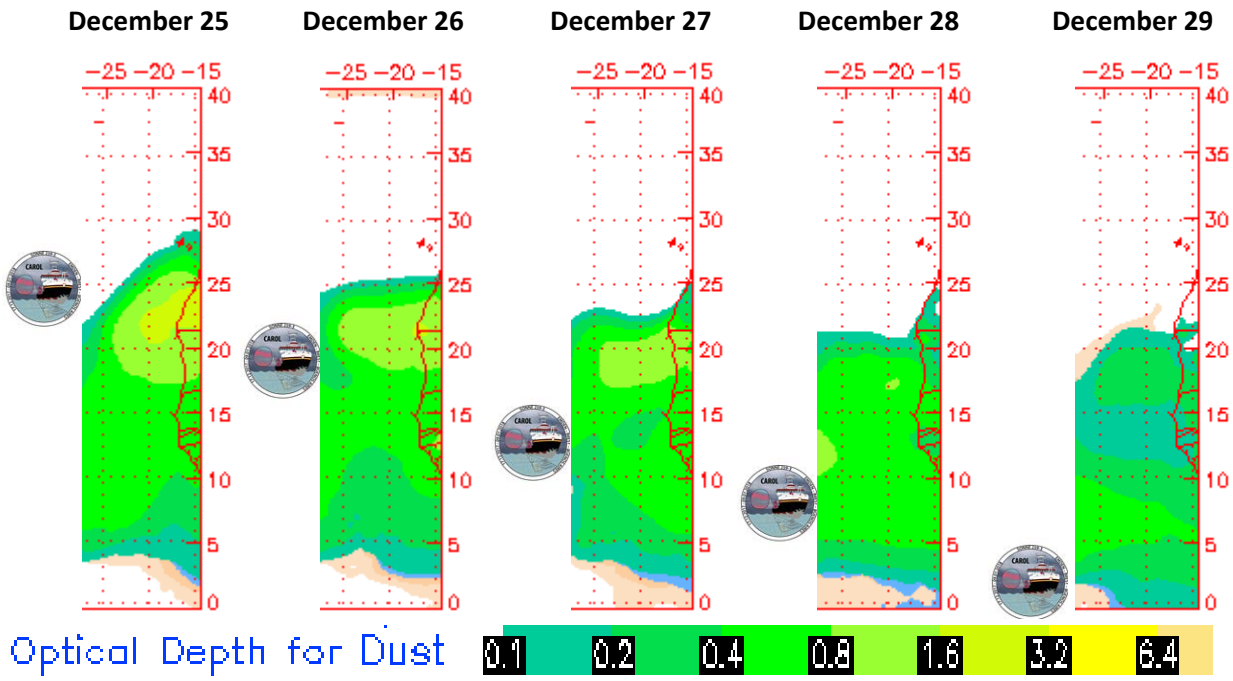

Figure 4 *NAAPS dust aerosol optical depths (at 550nm) at UTC noon times for the eastern tropical Atlantic from Dec 25 (left) progressing daywise to Dec 29 (right). The ship-label to the left of each panel shows the associated latitude location of the RV Sonne always at a longitude at near 20W.*

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