Answer to Editor

We thank the editor and the reviewer for the clarifications. Our answers are detailed below. Corresponding editor's remarks are underlined.

I asked the reviewer for clarification - his answer: "The reviewer wanted the authors to consider the residence time of the air parcel residing in the planetary boundary layer when determining the sources as shown in Fig. 3. Otherwise there will be a bias that the characteristics of free tropospheric aerosol (e.g. from long-range transport) will be averaged into the mean value."

We thank the reviewer for the precision. As explained in the answer to the reviewer, at PdD, the air is a mixture between free troposphere and boundary layer air with little possibilities to discriminate between the two unambiguously. Our seasonal analysis is also the result of a mixture between BL and FT air. We do not claim to provide BL air characteristics, but indeed a mixture of the two. We clearly state this in the paper by adding the following sentence:
"*Backtrajectories are not analysed for their residence time in the PBL or FT, as data obtained from the PdD station can be representative either of one or the other air mass layer (Venzac et al. 2009, Boulon et al. 2011). Hence Fig 3 is a spatial representation of the aerosol optical properties of a mixture between BL and FT air.*"

In addition, he asks to check the calculation that yields single scattering albedo values of 0.7 over the ocean (blue areas). These values appear to be too low.
Indeed, 0.7 is low for a single scattering albedo. However this is the value measured by the instruments when the aerosol concentration is low (scattering coefficient <2Mm-1). Similar values were measured at Junfraujoch. (0.7 is the 5th percentile of single scattering albedo measured at the JFJ, Personal communication M. Collaud Coen 2015).
This effect is probably induced by the different detection limits for the MAAP and the Nephelometer.

To avoid outliers and to follow the recommendations of the reviewer, we decided to filter single scattering albedo values for scattering coefficient lower than 2Mm-1.
This approach was already used in the literature (i.e. Andrews et al. 2011).
This is now precised in section 2.2:
"*To avoid artificially low ω0 values, ω0 was calculated only for σsca >2Mm−1*"

Figure 1,3 and table 1 were updated after recalculating the single scattering albedo.

The manuscript was updated to take into account the modifications in Figure 1: Now, Fig 3 shows that measurements in autumn are close to these in winter. Measurements in spring are similar to these in summer. Therefore, the word *winter* was replaced by *cold season,* and the word *summer* was replaced by *warm season*.

To take into account the modifications in Figure 3 the following sentence was

replaced:

“The single scattering albedo presented a smaller west–eastern gradient, suggesting that, in proportion to the total aerosol mass, the oceanic aerosol contained a higher absorbing fraction than over continental areas. This result could be surprising, as strongly absorbing anthropogenic aerosols such as black carbon are mainly emitted over continental Europe. This feature was confirmed by analysing the absolute values of absorption and scattering coefficients. Indeed, aerosols form continental Europe were more absorbing (σabs ≈ 3 Mm−1) than oceanic aerosols (σabs ≈ 1 Mm−1). However the difference was even stronger for the scattering coefficient between continental (σsca ≈ 25 Mm−1) and oceanic (σsca ≈ 5 Mm−1) air masses. Moreover, when particles coming from Eastern Europe were measured at PdD, they travelled over long distances and absorbing soot may have experienced a substantial ageing. This ageing resulted in the condensation of less absorbing species such as ammonium sulphate. “

by

“No clear spatial trend was visible on fig. 3 for the single scattering albedo”