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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Intercontinental transport of biomass burning pollutants over the Mediterranean Basin during the summer 2014 ChArMEx-GLAM airborne campaign" *by* Vanessa Brocchi et al.

Anonymous Referee #2

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This paper reports two interceptions of smoke plumes over the Mediterranean Sea by a French research aircraft, with various chemical sensors, from fires located in North America and Siberia. Two constituents were measured or inferred, black carbon aerosol and carbon monoxide gas. The data was modelled using a well-known trajectory model (FLEXPART) and a less well-known chemistry-transport model (MOCAGE). The data show that emissions from fire plumes on two separate continents can spread widely around the atmosphere, on occasion completing circumnavigation. The discussion of the data is somewhat qualitative and various estimates are made of injection

height from the sources of the plumes and of the amount of carbon monoxide which is released to account for the concentrations detected at the interception point. The reason for the need for this is not discussed any detail or whether this is typical when modelling smoke plumes. The paper is well written and is easy to comprehend. It could be improved in the following ways: 1. In addition to carbon monoxide and black carbon the paper reports that ozone measurements were made on board the aircraft but no use is made of these measurements. This is a major omission. Many papers do comment on ozone production during long-range transport. The authors are aware of this and quote suitable references. 2. It would be easier to understand the vertical structure of the smoke plumes if simple vertical profiles were shown rather than the complex system adopted by the authors with colour coding. The description in the text focuses on horizontal information whereas vertical information would be just as useful since this would indicate the thickness of the layers in a more obvious form. 3. The paper focuses on the use of the trajectory model FLEXPART to identify the origin of the smoke plumes. It does however also refer to the use of the chemistry-transport model but this is only used to confirm the FLEXPART findings. It is not used to comment on any chemistry which may occur as the plume progresses around the atmosphere. Surely some comments regarding ozone production or destruction in the plumes could have been discussed. 4. A minor point: The authors state in the text that on Flight 8 CO reaches 260ppb and the particle count spikes to approximately 1000 particles per ml. The majority of concentrations intercepted on Flight 8 and Flight 2 are rather similar and the higher concentration experienced on Flight 8 are only transitory. The text does not seem to convey this message. 5. On Flight 2, in Figures 5 and 6, two large spikes of particles are shown around 1300 UTC, however there seems to be no increase in CO. There is no comment about this; presumably they are not associated with the fire plumes. Do they contain black carbon for instance? The editors should decide whether the paper makes a sufficient contribution to current knowledge to merit its publication in ACP.

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