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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Organic and inorganic markers and stable C-, N-isotopic compositions of tropical coastal aerosols from megacity Mumbai: sources of organic aerosols and atmospheric processing" *by* S. G. Aggarwal et al.

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Aggarwal et al. (2012) used a variety of chemical tracers together with stable isotopic values (d15N and d13C) of Carbon and Nitrogen to track the sources of carbonaceous material in aerosols (PM10) collected over a coastal metro-city of Mumbai, India. Their results on isotopic characteristics of PM10 aerosols during summer and winter were compared with the available data to derive plausible sources. The results also revealed moderate to significant enrichments in d13C and d15N of aerosols, particularly in winter. They attribute combustion of biomass-biofuel and fossil fuel as the major source

of the Mumbai aerosols in both summer and winter periods. However, enriched isotopic values during winter possibly indicate prolonged photochemical processing with the aging of aerosols. Overall this study provides important chemical and isotopic database and examined the complex heterogeneous photochemical processes occurring in Mumbai aerosols (coarse size fraction).

One major point of concern in this study could be the sampling time of representative 'winter time' aerosols. Aggarwal et al. (2012) collected winter aerosols during 13-18 February (i.e. late winter) period for which the backward wind trajectories indicate the flow of air masses from west-northwest regions to reach Mumbai (Fig.3). Typical winter time for major portion of continental India, however, is December-January. During these two months pre-dominant biomass–biofuel burning becomes major contributor to carbonaceous aerosols, which are transported in south-southeast direction by the prevalent north-easterlies (INDOEX findings; Guozzatti et al., 2003; Kulshrestha et al., 2001). For instance, backward wind trajectory on same location on 15th January 2007 shows winds are coming northern regions of India. In difference to this typical winter time flow (north-northeast to south-southeast) of winds and aerosols the winter collection of samples by Aggarwal et al. (2012) was carried out when air masses were flowing into Mumbai from west and northwest regions (over the Arabian Sea). Therefore, studied 'late-winter' aerosols collected by Aggarwal et al.(2012) may not be truly representing winter time aerosols over Mumbai but could be diluted entities of the same. Therefore, in addition to local scale prolonged exposure/ photochemical processing, laterally transported carbonaceous aerosols via long range transport from north-northeast regions of India cannot be ruled out. Hence, authors may possibly examine into the behavior of characteristic tracers which can plausibly delineate long range transport versus local scale processes affecting aerosol chemical and isotopic composition and suitably address this issue.

The authors may refer to our recently published stable isotopic database of ambient aerosols over India and the North Indian Ocean (Agnihotri et al., 2011). In this study,

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we reported d15N and d13C values of bulk aerosols over six different urban locations of India and also typical isotope ratios of aerosols emitted from various bio-fuels conventionally burnt in the north and northeast India (Tables 2 & 3). While discussing d15N and d13C values of plausible sources (pages 20605 and 20607) consideration of isotopic database of Agnihotri et al. (2011) might prove useful and more relevant in a regional perspective.

References- Agnihotri, R., Mandal, T.K., Karapurkar, S. G., Naja, M., Gadi, R., Ahammmed, Y. N., Kumar, A., Saud, T., Saxena, M., 2011. Stable carbon and nitrogen isotopic composition of bulk aerosols over India and northern Indian Ocean, Atmospheric environment 45, 2828-2835

Guazzotti S.A., Suess D.T., Coffee K.R., Quinn P.K., Bates T.S., Wisthaler A., Hansel A., Ball W.P., Dickerson R.R., Neusub C., Crutzen P.J., Prather K.A., 2003. Characterization of carbonaceous aerosols outflow from India and Arabia: biomass/biofuels burning and fossil fuel combustion. Journal of Geophysical Research 108, doi:10.1029/2002JD003277

Kulshrestha U.C., Jain M., Sekar R., Vairamani M., Sarkar A.K., Parashar D.C., 2001. Chemical characteristics and source apportionment of aerosols over Indian Ocean during INDOEX-1999. Current Science 80, 180–185.

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