

Interactive comment on “A 12 year observation of water-soluble inorganic ions in TSP aerosols collected at a remote marine location in the western North Pacific: an outflow region of Asian dust” by S. K. R. Boreddy and K. Kawamura

Anonymous Referee #2

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General Comments

The manuscript explores the chemical composition of water-soluble inorganic ion over a remote marine atmosphere in the western North Pacific. TSP aerosol samples are collected from Chichijima Island and analyzed for water-soluble ions such as Na^+ , NH_4^+ , K^+ , Mg^{2+} , Ca^{2+} , Cl^- , NO_3^- , SO_4^{2-} and MSA^- . The manuscript covers a 12-year observation and focuses on the impact of long range transport from East Asia on water-soluble ionic composition. Furthermore, the study identifies the decadal variabil-

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ity in nitrate, sulfate and nssK^+ particularly considering anthropogenic emissions and biomass burning originating from East Asia. In this respect, it may be the interest of scientific community. Consequently I suggest acceptance of the manuscript. However, before that the manuscript should be revised.

Specific Comments

Title: I suggest modification of the title. Although the title implies that the water-soluble inorganic ions are of interest, the organic water-soluble methane sulfonic is also discussed in the text. For example, whole section (3.7) is dedicated to methane-sulfonic acid. It would be misleading to retain ‘inorganic’ before ions. The discussion about the dust transport from the Asia is particularly limited (see comments below). Unlike the ‘title’ (as it implies), the manuscript mainly focuses on the pollution transport from Asian continent. To illustrate, the impact of pollutants originating from Asia on the annual variability of chemical species is discussed in detail (in section 3.5). Thus, please modify the title according to the abovementioned statement.

Experimental

2.1. Sampling site and aerosol sampling: Please give more information about the sampling. Was the aerosol sampling carried out daily or weekly? What was the degree of blank contributions to water-soluble ions?

2.2. Analysis of chemical species: In order to determine the concentrations of the water-soluble ions a punch of 2mm diameter from each filter was extracted. Was a punch of 2mm diameter representative for the collected aerosol sample when one considers the area of the filter? Please specify this issue.

Results and Discussion

3.1. Evaluation of Non Sea Salt Analysis: Please move this section to Experimental section, since this section simply defined the calculation of non-salt fractions.

3.3. Temporal Variation of Major Inorganic Species, $\text{MSA}^-/\text{nssSO}_4^{2-}$ and $\sum -/\sum +$:

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3.4. Monthly Variations of Major Inorganic Species, MSA-/nssSO42-:

Please supply a table that shows relationship between the water-soluble species. Such an application would be useful to determine the (a) similar sources, (b) similar generation and/or removal mechanism and/or (c) similar transport patterns.

(Page 10, lines 286-289): It is claimed that drastic increase in the concentration of nssCa during spring was associated with dust transport originated from Asian continent. However, this claim should be supported by using dust episode. It would be useful to identify at least one dust event and discuss the episode in detail by applying ground measurements, back trajectories and satellite images.

3.6. Percent Contribution of Major Ions to Total WSIM

The depletion of the Cl was ascribed to reaction between the alkaline sea-salt particles and the acidic species namely, sulfuric acid, nitric acid and oxalic acid (page 12, lines 349-367). Considering the written text, it is not clear which acid or acids responsible for the depletion of Cl. This claim should be clarified. For instance, the relationship between Cl depletion and acid species might be useful to address this issue.

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 15, 7419, 2015.

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