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Molecular characterization of cloud water collected at the Reunion Island (Indian Ocean) by FT-ICR MS.

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Clouds are still one of the most important uncertainties in climate comprehension, and it is largely due the lack of knowledge about the role of clouds on atmospheric chemistry. Many compounds can dissolve in this medium but cloud chemical composition and transformations are still badly evaluated. Among those compounds, the Dissolved Organic Matter (DOM) has been poorly characterized. Few studies tended to explore cloud molecular composition, using Fourier Transform Ion Cyclotron Resonance Mass Spectrometry (FT-ICR MS) analysis. However, the variety of clouds collected is still limited to few sampling sites, located in the northern hemisphere and not representative of diverse environmental conditions.

In this study we present the characterization of the chemical composition of three cloud samples collected during the Bio Maïdo field campaign, in the Reunion Island (Indian Ocean). Clouds form from air masses coming from the ocean that move up on the slope of the mountain and have been collected at 1760 m a.s.l.. Cloud water was firstly desalted and pre-concentrated by solid phase extraction and then analyzed by FT-ICR MS with electrospray ionization. Molecular formula were assigned using MFAssignR software. An important number of molecular formula indicates the presence of secondary organic aerosol and is linked to the atmospheric processing. Nevertheless, the largest number of compounds is less oxidized and probably linked to emissions from vegetation and urban areas. Thus, the marine influence is partially masked by anthropogenic and natural emissions.

FT-ICR MS is a powerful tool to investigate cloud water composition: in contrast to the methodology previously used for cloud water study, it provides a global overview of the DOM. Combined with classification methodologies, such as van Krevelen diagram or Rivas-Ubach classification (Renard et al., 2022), it may highlight which families of compounds are preferentially transformed. The last part of this work aims to investigate the differences and similarities with cloud water collected at the puy de Dôme observatory, in the Massif Central region (France).

Renard, P., Bianco, A., Jänis, J., Kekäläinen, T., Bridoux, M., & Deguillaume, L. (2022). Puy de Dôme Station (France): A stoichiometric approach to compound classification in clouds. *JGR: Atmospheres*, *127*(16), e2022JD036635.