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Trends in the chemical composition of wet deposition in South Africa

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The chemical composition of wet deposition reflects various interacting physical and chemical processes in the atmosphere, which include emission and source strengths, transport processes, atmospheric chemical reactions and removal processes. Trends in the atmospheric sulphur (S) concentrations in rain water give a good indication of the impact of anthropogenic activities in the region while trends in the atmospheric nitrogen deposition is influenced by various anthropogenic and natural sources. By comparing the volume weighted mean concentration of these and other species and elements in rain water over a long time period at a site, a sound understanding of the different sources, their impacts and the potential environmental change it can result in, can be developed.

In this contribution, the inter-annual variability and seasonal variations in the chemical composition of rain water at four sites in South Africa over a five-year period (2009 - 2014) will be discussed and compared to a previous sampling period (before 2000). The four sites can be described as representing a heavy industry regional site (Amfersfoort), an industrialized metropolis site (Vaal Triangle) and two regional background sites (Skukuza and Louis Trichardt) that is impacted by different natural sources in the region. From the results, it is evident that, although the four sites are from a global perspective relatively in close proximity, large inter-annual variations in the ionic concentrations occur between these sites, which emphasises the importance of a good spatial coverage when identifying regions that are environmentally at risk. Relatively large seasonal variations are also observed due to meteorological and environmental changes such as rainfall depth, land cover, vegetation growth, biomass burning and anthropogenic activities. These observations demonstrate the necessity and value of WMO GAW linked long-term atmospheric observations for sound decision making processes.