The chemical composition of the atmosphere in the Anthropocene

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During a substantial part of the Earth's history the atmosphere (Greek 'atmos'='vapour' + 'spharia'='ball') has been brought to thermodynamic disequilibrium by biological processes (Wayne, 2000). In fact, plants have played a crucial role in determining atmospheric change and hence the conditions on the planet we know today (Beerling, 2008). The epoch of Anthropocene is bringing with it large changes in the environment (Crutzen and Stoermer, 2000). These alterations cause perturbations in biogeochemical cycles that induce extensive further changes in the atmospheric chemical composition.

Although anthropogenic changes are driven by human induced emissions, atmospheric chemistry plays a large role in determining the burden and residence time of atmospheric constituents. In the atmosphere, a gaseous chemically active compound can be affected by interaction with other species in its immediate vicinity and interaction with solar radiation (photolysis). Atmospheric chemistry is characterized by many interactions and patterns of temporal or spatial variability, leading to significant nonlinearities and a wide range of time scales of importance (Isaksen et al., 2009). Most radiatively active compounds in the Earth's atmosphere are chemically active, meaning that atmospheric chemistry plays a large role in determining their burden and residence time and thus their forcing of climate change in the Anthropocene (Myhre et al., 2013).

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