



## **A modelling study of the present day budget of atmospheric H<sub>2</sub> and HD and the environmental controls on its soil sink.**

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A future global hydrogen-based economy is a possibility as oil reserves run out. However, the present day hydrogen budget is not well understood. We need to understand H<sub>2</sub> in the air today before the impact of future H<sub>2</sub> emissions can be accurately estimated in a hydrogen-based energy industry. In this study, detailed model studies are performed to better understand the present day H<sub>2</sub> budget. Emission datasets are compiled for both anthropogenic and natural sources of atmospheric H<sub>2</sub>. These are included in 3D global model simulations of both H<sub>2</sub> and HD. Model simulations compare well to atmospheric observations, accurately reproducing both the latitudinal gradient and seasonal cycles. They demonstrate the importance of soil uptake in controlling H<sub>2</sub> levels and distribution, and further indicate how changes in temperature, soil moisture and snow cover influence soil uptake on a global scale.