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Continuous high-frequency measurements of hydrogen at the Mace Head baseline site between 1999 and 2007

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Continuous high-frequency automatic measurements of hydrogen have been made at the Mace Head atmospheric research station on the Atlantic Ocean coast of Ireland presenting a full 9 year record from 1999-2007 representing one of the most comprehensive records of hydrogen to date. Individual measurements have been analysed using the NAME Lagrangian dispersion model separating clean, maritime air masses from regionally polluted European air masses and those transported from southerly latitudes. Hydrogen concentrations in mid-latitude Northern Hemisphere baseline air show a distinct seasonal cycle with highest concentrations during spring and lowest concentrations during late autumn, with peak-to-trough amplitude of 40.0$\pm$5.4 ppb, averaged over the observed seasonal cycles 1999-2007. The mean hydrogen concentration in mid-latitude Northern Hemisphere baseline air from 1999 to 2007 was estimated to be 496.9 ppb. Hydrogen dry deposition over this measurement period has been calculated for nighttime inversion events with low wind speeds and is estimated to be between 0.01 and 0.3 cm/s. European polluted air masses were found to have an average molar H2 to CO ratio of 0.31 over the entire period.