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Long-term measurements of atmospheric trace gases (CO_2, CH4, N2O, SF6, CO, H2), O_2, and δ13CH4 isotopes at Weybourne Atmospheric Observatory, UK: past, present and future

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The Weybourne Atmospheric Observatory (WAO) is situated on the north Norfolk Coast (52.95°N, 1.13°E) in the United Kingdom and is run by the University of East Anglia (UEA), with support from the UK National Centre for Atmospheric Science (NCAS). In 2016, the WAO became a UK-ICOS (Integrated Carbon Observing System) monitoring station. Since 2008, we have been collecting high-precision long-term in situ measurements of atmospheric carbon dioxide (CO_2), oxygen (O_2), carbon monoxide (CO) and molecular hydrogen (H2), as well as regular bag sampling for δ13CH4. In early 2013, the measurement of atmospheric methane (CH4) commenced, and nitrous oxide (N2O) and sulphur hexafluoride (SF6) began in 2014. We summarise the CO_2, O_2, CH4, N2O, SF6, CO, H2 and δ13CH4 measurements made to date and highlight some key features observed (e.g. seasonal cycles, long-term trends, pollution events and deposition events). We summarise how the long-term measurements fit into other broader projects which have helped to support the long term time-series at WAO over the years, and highlight how we contribute to broader global atmospheric observation networks.