

Weybourne Atmospheric Observatory

1) Introduction

<https://www.ncas.ac.uk/en/256-amf-main-category/amf-wao/1088-wao-overview>

The Weybourne Atmospheric Observatory (WAO) is a Regional station in the Global Atmosphere Watch (GAW) programme of the World Meteorological Organization (WMO). It is situated on the North Norfolk coast (52°57'02"N, 1°07'19"E, 15 m asl). Weybourne is operated by the UEA having been established in 1992 by Professor Stuart Penkett (retired 2004) with funding from BP (Norway) plc and NERC. Subsequently, long term monitoring and campaigns have been supported through numerous projects funded by NERC, Department of the Environment (DoE, Defra) and the EU. NCAS has also supported the site since 2002. Much of the instrumentation has come from HEFCE JIF and SRIF funds.

Weybourne's location means that it experiences air with a wide range of pollution levels. Predominant south-westerlies bring polluted air from the UK (including from London and the Midlands). At times, especially in anticyclonic conditions, Weybourne experiences polluted air from Europe. Weybourne can also receive clean background air in northerly air flow. This can be impacted by narrow pollution plumes from shipping in the N. Sea, and potentially gas platforms. Many successful campaigns have been hosted at Weybourne to examine oxidizing capacity, organic chemistry, carbonaceous particles, night-time chemistry and cloud impacts on radiation. In addition to the permanent building (see photo) there is adequate power and space to support instrumented mobile labs and containers. The site is also used by the wider community for instrument testing.

Over the years the parameters measured at Weybourne have varied according to the funding and/or scientific interests and requirements. There have been continuous measurements of ozone, as part of the Defra network, and basic meteorological parameters. There are many years of CO, NO_x, NO_y, SO₂, CN, VOC and H₂ data. In 2007 a long term monitoring programme for CO₂ and O₂ began. In 2012 a new greenhouse gas GC was set up and measurements of CH₄ started. This has been developed to also include measurements of N₂O and SF₆. In 2017 a state-of-the-art Fourier Transform Infrared Spectrometer (FTIR) was added to Weybourne to give very high precision measurements of additional CO₂, CH₄, N₂O and CO.

Through the introduction of the FTIR to Weybourne in 2017, the site now forms part of the UK's commitment to the EU funded Integrated Carbon Observation System (ICOS). This is a pan-European Research Infrastructure that provides very high quality, harmonised data on the cycles of carbon and other greenhouse gases. Through ICOS Weybourne has been at the forefront of instrument testing and has been fundamental in getting the FTIR instrument approved on the network.

As well as being the only UK atmospheric station within the ICOS network and part of the Defra ozone network (AURN), Weybourne has been / is part of the Defra TOMPS network (atmospheric toxic organic samplers), a Defra CH₄ network, the EU InGOS network (Integrated non-CO₂ Greenhouse gas Observing System) and is now contributing measurements to the NERC funded MOYA and DARE-UK projects.



Most of the data collected between 2002 and 2019 are available via CEDA. Other data from this period can be obtained on request from the University of East Anglia upon request. The newer greenhouse gas data (CO_2 , CH_4 , CO , N_2O , SF_6 and H_2) are routinely uploaded to CEDA and the CO_2 and CH_4 from the FTIR is submitted to ICOS from 2019 as part of the UK's commitment. The CO_2 data from the Siemens analyser is submitted to the NOAA GLOBALVIEWplus (GV+) ObsPacks. In addition the greenhouse gas data from Weybourne is submitted to the World Data Centre for Greenhouse Gases (WDCGG) which operates under the Global Atmosphere Watch (GAW) programme of the World Meteorological Organization (WMO). The submission of greenhouse gas data to ICOS, ObsPack and the WDCGG ensures that the data from Weybourne is widely disseminated throughout the International greenhouse gas community to enable maximum exposure and accessibility for potential users.

The UEA's Weybourne webpage (<http://weybourne.uea.ac.uk/>) allows users to get access to "first look" near real time (NRT) data products for a range of chemical (greenhouse gases, AQ products) and meteorological parameters. In addition this page, along with the NCAS Weybourne page (<https://www.ncas.ac.uk/en/256-amf-main-category/amf-wao/1088-wao-overview>) provides information about the facility. We envision what NRT data streams from the UEA website will be available on the official NCAS website in the near future.