

SOLAS UK report for SOLAS SSC: May 2008

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1. Overview of UK activities

Since 2004, most SOLAS-related research in the UK has been supported through the *UK SOLAS directed programme*, funded by the Natural Environment Research Council (NERC). More than 25 projects at 12 research laboratories are involved, at a total cost of around £11m. Component studies were chosen from competing proposals, addressing overall aims and objectives defined by the UK SOLAS Science Plan. For details, see www.nerc.ac.uk/research/programmes/solas.

This report primarily relates to that programme. However, there is other UK research contributing to SOLAS objectives, and many of the projects within UK SOLAS are nearing completion (formal programme end in 2009-10). Future UK effort in SOLAS is likely to be through more diverse funding mechanisms, with some change in focus; e.g. increased attention to ocean acidification.

2. Major fieldwork campaigns

Since March 2007, there have been five UK SOLAS research cruises, one linked with an aircraft campaign. Their geographical focus has been the North East Atlantic, as summarised below.

Research cruises [* cruise report at www.bodc.ac.uk/projects/uk/uksolas/cruise_programme]

**Discovery 317*. 21 March - 12 April 2007; NE and central Atlantic. Principal Scientist: Ian Brooks, Leeds. Main project: SEASAW, field observations of sea spray, gas fluxes and whitecaps. Direct eddy covariance measurements of turbulent fluxes made at up to wind speeds of 18 ms⁻¹.

**Discovery 319*. 19 May - 11 June 2007; transects Lisbon - Cape Verde - Falmouth, UK. PS: Gordon McFiggans, Manchester. Main project: RHaMBLe, Reactive halogens in the marine boundary layer. Also fieldwork for ACMME project (Aerosol characterisation and modelling in the marine environment, PI James Allan) and linking with research flights (below) and US SOLAS studies at the Cape Verde Observatory.

**Discovery 320*. 16 June - 14 July 2007; NE Atlantic. PS: Rob Upstill-Goddard, Newcastle. Main project: DOGEE, Deep ocean gas exchange experiment. Two tracer patches deployed and tracked, one with surfactant. Gas transfer velocities determined.

Discovery 325. 13 November - 18 December 2007; off NW Africa. PS: Gill Malin, UEA. Main project: INSPIRE, Investigation of near-surface production of iodocarbons - rates and exchanges.

Discovery 326. 5 January - 5 February 2008; off NW Africa and central Atlantic. PS: Eric Achterberg, Southampton. Main project: Impact of atmospheric-derived metal and nutrient inputs on near-surface biota. Cruise blog at at www.eur-oceans.info/diary/dust_cruise/.

Aircraft campaign

NERC (ARSF) research flights, 25 May - 3 June 2007, using Dornier 229. Main project: Chemical and physical structure of the lower atmosphere of the tropical eastern North Atlantic; PI Alastair Lewis, York. Total of 17 flights from Sao Vicente, Cape Verde, linking with *Discovery 319* and Observatory studies.

The final UK SOLAS research cruise was scheduled for May - June 2008, off N W Africa, to investigate the impact of coastal upwellings on air sea exchange of climatically important gases (ICON; PS: Carol Robinson, UEA). Unfortunately that has very recently been postponed, due to ship problems. Re-scheduling options are currently being explored.

3. Time series studies

Cape Verde Observatory

Starting in October 2006, a suite of SOLAS-relevant atmospheric measurements have been made on Sao Vicente, Cape Verde. Project PIs: Mike Pilling (Leeds) and Lucy Carpenter (York), in collaboration with international partners. See www.york.ac.uk/capeverde. Important scientific findings include a re-assessment of the role of marine halogens in tropospheric ozone destruction. UK support for the atmospheric component of the observatory is expected to continue until at least 2010, providing the opportunity to directly complement the marine observations

Air-sea flux measurements in Norwegian Sea

The Norwegian weathership *MS Polarfront* has been instrumented to automatically collect a range of data on surface ocean parameters and air-sea fluxes. Project PI: Margaret Yelland (Southampton), in collaboration with the Norwegian Meteorological Institute and other international partners. Measurements started in September 2006, and are currently funded to September 2008; an extension bid is under review. Further information and data at www.noc.ac.uk/ooc/CRUISES/HiWase

4. Meetings and other events

The 2007 UK SOLAS Annual Science Meeting was held at University of Leeds, 25 - 27 September. Other programme meetings have included workshops on Reactive Halogens in the Marine Boundary Layer (Manchester, 30 Jan - 1 Feb 2008); Halogen Intercomparisons (London, 4 Feb 2008; with COST); "k Conundrum" (6-7 Feb 2008, Norwich; with COST) and Dust Dynamics (Reading, 26 Feb 2008).

UK SOLAS provided support for 10 students/young researchers to attend the 3rd international SOLAS Open Science Conference (Xiamen, China; 6- 9 March 2006). Total UK participation was 35 (out of ~220), with UK authors contributing 29 posters (out of 215), 4 oral overview papers (out of 21) and leading/co-leading 6 (out of 11) workshop sessions.

The UK SOLAS programme has been well-represented at several other international meetings, including the 15th American Meteorological Society Conference on Air-Sea Interaction; 20-24 August 2007, Portland, Oregon (5 posters and 2 oral papers).

The UK Challenger Society has included "Ocean-atmosphere interactions and biogeochemical cycling" as one of four science themes for the meeting, as one of four main themes for its biennial conference (Bangor, 8- 11 Sep 2008). The 2008 UK SOLAS Annual Science Meeting is provisionally scheduled for 6-8 October, at Southampton.

An outreach exhibit 'The Breathing Ocean' is currently in preparation, for display at the Royal Society Summer Science Exhibition, London, 30 June - 3 July 2008. Some parts of this may be suitable for public exhibition at the 2009 SOLAS Open Science Conference in Barcelona.

5. Other SOLAS related work in the UK

The UK SOLAS directed programme is well connected to other relevant UK research. Particular attention to date has been directed at maximising synergies with the Centre for Air-Sea Interactions and Exchanges (CASIX); Quantifying the Earth System (QUEST); the African Monsoon Multidisciplinary Analysis (AMMA, linked to the Met Office DABEX project); Aerosol Properties, Processes And Influences on the Earth's climate (APPRAISE); and the NERC marine Centres' Oceans 2025 programme, that now provides support for the Atlantic Meridional Transect (AMT).