

## Report for the year 2018 and future activities

### SOLAS Australia

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*This report has two parts:*

- **Part 1:** reporting of activities in the period of January 2018 – Jan-Feb 2019
- **Part 2:** reporting on planned activities for 2019/2020 and 2021.

*The information provided will be used for reporting, fundraising, networking, strategic development and updating of the live web-based implementation plan. As much as possible, please indicate the specific SOLAS 2015-2025 Science Plan Themes addressed by each activity or specify an overlap between Themes or Cross-Cutting Themes.*

- 1 Greenhouse gases and the oceans;
  - 2 Air-sea interfaces and fluxes of mass and energy;
  - 3 Atmospheric deposition and ocean biogeochemistry;
  - 4 Interconnections between aerosols, clouds, and marine ecosystems;
  - 5 Ocean biogeochemical control on atmospheric chemistry;
- Integrated studies;  
Environmental impacts of geoengineering;  
Science and society.

**IMPORTANT:** *This report should reflect the efforts of the SOLAS community in the entire country you are representing (all universities, institutes, lab, units, groups, cities).*

#### **PART 1 - Activities from January 2018 to Jan/Feb 2019**

##### **1. Scientific highlight**

##### **Atmospheric research aboard the RV *Investigator***

The Australian Marine National Facility RV *Investigator* is equipped with world-class facilities for undertaking atmospheric research. Its Global Atmosphere Watch (GAW) station provides continuous, high-quality atmospheric data wherever the vessel goes. For atmospheric-focussed projects, it provides excellent infrastructure for guest instruments.

GAW is the only long-term international global programme providing a framework for observations and assessment of the state and development of environmental issues related to atmospheric chemical composition.

The RV *Investigator* hosts a comprehensive set of measurements in three of the GAW focal areas (equivalent to a GAW global station): (1) aerosols (e.g., black carbon and CCN), (2) reactive gases (e.g., ozone mixing ratio), and (3) greenhouse gases (e.g., greenhouse gas

mixing ratios). The RV *Investigator* provides infrastructure for guest scientists, enabling intensive project-based measurements. This infrastructure includes two dedicated atmospheric labs, a clean outdoor sampling space, and a range of specially designed systems for atmospheric measurements.

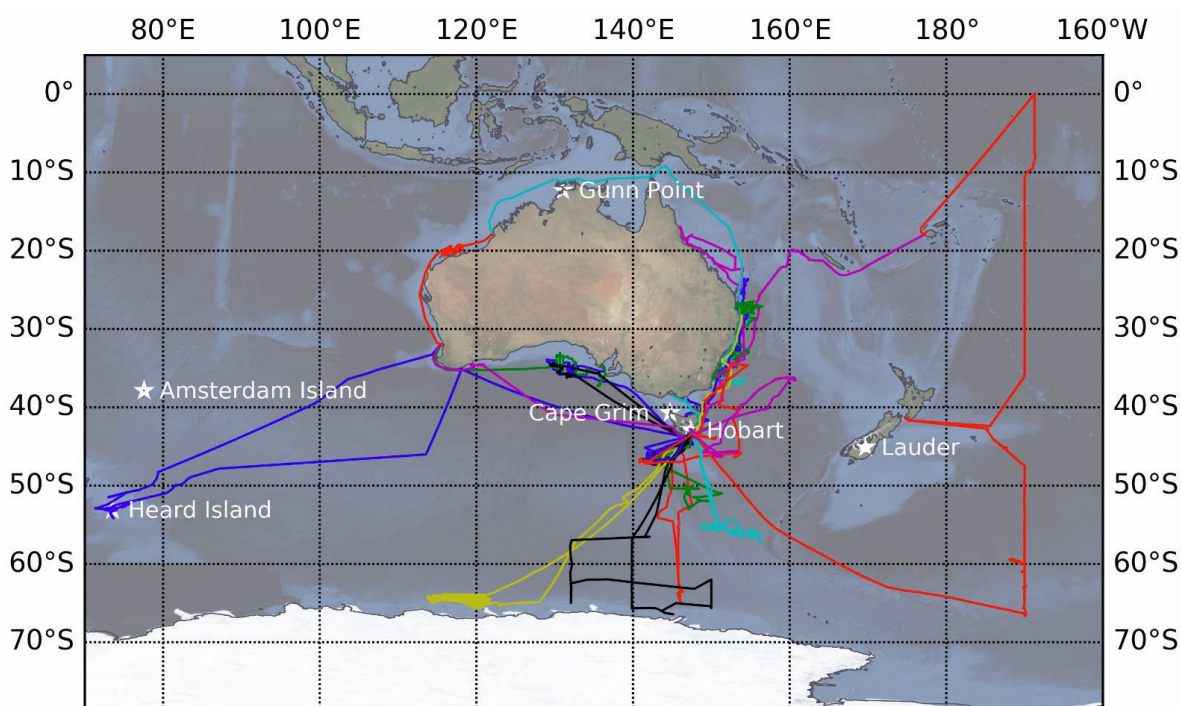


Figure 1. Voyages undertaken by the RV *Investigator* from its commissioning in 2014, until December 2018. Voyage tracks are determined by scientific objectives which are assessed in a competitive process by peer-review and independent steering committee. Capable of travelling from Antarctica's ice-edge up to the equator, the *Investigator* is at sea for up to 300 days each year, and is capable of travelling almost 11 000 nautical miles in a single voyage. Starred locations show other GAW station locations in the region (except Heard Island).

**2. Activities/main accomplishments in 2018 (projects, field campaigns, events, model and data intercomparisons, capacity building, international collaborations, contributions to int. assessments such as IPCC, interactions with policy makers or socio-economics circles, social sciences, and media).**

- Australia's RV Investigator registered as the world's first mobile GAW station, providing ongoing atmospheric measurements from the Southern Hemisphere's marine environment <https://research.csiro.au/acc/rv-investigator-recognised-as-worlds-first-mobile-gaw-site/>
- RV Investigator January/February 2018 voyage (IN2018\_V01 – CAPRICORN2), investigated cloud and aerosol properties in the deep southern ocean, alongside the larger SOCRATES project. <https://www.eol.ucar.edu/content/socrates-iss-0>  
<http://media.bom.gov.au/social/blog/1628/studying-clouds-over-the-southern-ocean/>
- Aurora Australis research voyages - MARCUS and CAMMPCAN – parallel projects, measuring aerosol and cloud properties in the Antarctic sea-ice region. MARCUS was 2017/18 summer, while CAMMPCAN's main deployment period is 2018/19 summer season. <http://www.antarctica.gov.au/news/2018/seedling-southern-clouds>  
<https://www.abc.net.au/news/2018-12-16/cloud-researchers-using-new-technology-in-antarctica/10623752>

- Rainforest to Reef Workshop Aspendale <https://airbox.earthsci.unimelb.edu.au/reef-to-rainforest/>
- Voyages highlighted on Airbox page <https://airbox.earthsci.unimelb.edu.au/#tab19>

### 3. Top 5 publications in 2018 (only PUBLISHED articles) and if any, weblinks to models, datasets, products, etc.

Luhar, A.K., Woodhouse, M. T., and Galbally, I. E (2018): A revised global ozone dry deposition estimate based on a new two-layer parameterisation for air–sea exchange and the multi-year MACC composition reanalysis. Atmospheric Chemistry and Physics, 18, 4329-4348, <https://doi.org/10.5194/acp-18-4329-2018>.

Dominick, D., Wilson, S.R. Paton-Walsh, C. , Humphries, R., Andree Guérette E., Keywood, M.D., Kubistin, D., Marwick, B. Characteristics of airborne particle number size distributions in a coastal-urban environment, Atmospheric Environment, Volume 186, 2018, Pages 256-265, ISSN 1352-2310, <https://doi.org/10.1016/j.atmosenv.2018.05.031>

Jones, G., Curran, M., Deschaseaux, E., Omori, Y., Tanimoto, H., Swan, H., et al. (2018). The flux and emission of dimethylsulfide from the Great Barrier Reef region and potential influence on the climate of NE Australia. Journal of Geophysical Research: Atmospheres, 123, 13,835–13,856. <https://doi.org/10.1029/2018JD029210>

Cropp, R., Gabric, A., van Tran, D. et al. Coral reef aerosol emissions in response to irradiance stress in the Great Barrier Reef, Ambio (2018) 47: 671., Australia <https://doi.org/10.1029/2018JD029210>

Humphries, R. S., McRobert, I. M., Ponsonby, W. A., Ward, J. P., Keywood, M. D., Loh, Z., Krummel, P. B., and Harnwell, J.: Identification of platform exhaust on the RV Investigator, Atmospheric Measurement Techniques Discussions, <https://www.atmos-meas-tech-discuss.net/amt-2018-214/>, in review, 2018.

### 4. Did you engage any stakeholders/societal partners/external research users in order to co-produce knowledge in 2018? If yes, who? How did you engage?

## PART 2 - Planned activities for 2019/2020 and 2021

### 1. Planned major field studies and collaborative laboratory and modelling studies, national and international (incl. all information possible, dates, locations, teams, work, etc.).

Future RV Investigator voyages

-Oct-Dec 2019– IN2019\_v06 [to understand the Maritime Continent region](#), 2 x 30 day voyages Darwin to Christmas Island, and Christmas Island to Darwin.. Maritime Continent observations of atmospheric convection, biogenic emissions, ocean vertical mixing, and the Indonesian Throughflow. Atmospheric chemistry, surface meteorology, and air-sea flux components to operate for entire voyage

- Measuring the world's cleanest air – validating atmospheric measurements above the Southern Ocean (IN2020\_V08) (August/September 2020) will provide a first-ever comparison of two Global Atmospheric Watch stations (Cape Grim and the RV Investigator). This will allow validation of Investigator aerosol instrumentation against a world-class benchmark which will improve confidence in both stations.

**2. Events like conferences, workshops, meetings, schools, capacity building etc. (incl. all information possible).**

**3. Funded national and international projects / activities underway.**

ARC Discovery funding, 2019-22, "Dust to the ocean: Does it really increase productivity?" Zanna Chase, Andrew Bowie, Peter Strutton

Involvement in proposed SCOR Working Group on "Co-ordinated approach for Aerosol Trace element Solubility and Bioavailability Research in Oceanography"

**4. Plans / ideas for future projects, programmes, proposals national or international etc. (please indicate the funding agencies and potential submission dates).**

**5. Engagements with other international projects, organisations, programmes etc.**

Engagement with Australia GEOTRACES program

**Comments**