SCOR Working Group 167, RUSTED

1. Brief summary with the main highlights (200-300 words)

The second year of the SCOR WG 167 has focused on subgroups working to deliver each individual task.

A quarterly WG newsletter was launched March 2024 to share news across RUSTED participants and build a sense of community between WG members.

Meetings

This year RUSTED held 2 all-hands meetings , 1 co-chair meeting, and 3 subgroup meetings. All meetings were virtual and scheduled to ensure maximum participation by varying the start times. An ad-hoc meeting with Oceania based RUSTED members was organized to optimize their participation (10th April 2024).

At AGU 2023 RUSTED modelers met to discuss future plans, including potential for collaboration with a SCOR WG FeMIP

A hybrid annual meeting will be held in November 2024 in Goa, India alongside the SOLAS Open Science Conference event (to achieve minimum carbon footprint and maximum scientific outreach). Eight members will attend the meeting in person thanks to provision of travel funding from SCOR.

Conference sessions

RUSTED has several sessions planned for the SOLAS OSC:

1. The planned RUSTED Early Career Researcher workshop will be held at the National Institute of Oceanography, Goa, India, on the 9th and 10th November 2024 (Prior to the OSC).
2. The RUSTED annual meeting 2024
3. A 1 hr discussion session with the SOLAS community
4. A project planning meeting with FeMIP SCOR WG's chair, A. Tagliabue.

Funds have been provisionally raised from NSF (Atmospheric Chemistry Program) to hold a workshop in the USA in Summer 2025

Scientific output

RUSTED inter-journal Special issue (Copernicus) is currently open and has to date received 6 publications.

Preliminary data processing and interpretation and a manuscript plan were drafted by the Inter-comparison sub-group.

A meeting will be organized in Sept-Oct 2024 to discuss manuscript sections writing.

2 short articles were published in Eos (Shelley et al., 2024) and in the inter-journal RUSTED special issue (Perron et al., 2024), which acknowledged SCOR funding.

2. Activities since the previous report to SCOR (e.g., virtual or in-person meetings, email discussions, special sessions). Limit 1000 words

- Launch of the RUSTED inter-journal Special issue (January 2024)
- Preliminary data processing and interpretation and a manuscript plan were drafted by the Inter-comparison sub-group (ongoing)
- Organization of the RUSTED Early Career Researcher workshop (in collaboration with the SOLAS Early Career Scientific Day organization committee) and activities (discussion session, poster, meeting with FeMIP) in preparation of the November in person event in Goa, India.

3. Documents published since previous report to SCOR (e.g., peer-reviewed journal articles, reports, Web pages) and should be limited to publications that resulted directly from WG activities and which acknowledge SCOR support

- Shelley R., M.M.G. Perron, D.S. Hamilton, A. Ito. The open ocean, aerosols, and every other breath you take, Eos *105* (2024). doi.org/10.1029/2024EO240091.
- Perron M.M.G., Fietz S., Hamilton D. S., Ito A., Shelley R. U., and Tang M.: Preface to the inter-journal special issue "RUSTED: Reducing Uncertainty in Soluble aerosol Trace Element Deposition", Atmos. Meas. Tech., 17, 165–166 (2024). doi.org/10.5194/amt-17-165-2024.
- Sagar Rathod, Douglas S. Hamilton, Lance Nino, Sonia M. Kreidenweis, Emily Bian, Natalie M. Mahowald, Jeffrey R. Pierce, and Tami C. Bond (*In Press*) Constraining present-day anthropogenic total iron emissions using observations and models. *Journal of Geophysical Research: Atmospheres.*
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4. Progress toward achieving group's terms of reference. List each term of reference separately and describe progress on each one. Limit 1000 words

ToR 1

The planned literature review of leaching methods drafting has started, some literature search is still underway as well as discussions on the manuscript structure and "classification" method for all existing leaching schemes. The manuscript will provide guidelines on the aerosol leaching techniques to be used to investigate different processes that occur to aerosols from atmospheric updraft to oceanic deposition (wet vs dry deposition, seawater solubility, atmospheric weathering ...etc.). This review will also include discussion on the choice of laboratory equipment and reagents and costs associated, making a significant step towards standardization of methods. This manuscript will be submitted to the RUSTED inter-journal Special Issue in *Atmospheric Measurement Techniques* in 2025.

A Glossary of Terms is being compiled with the aim of reducing inconsistencies in the terminology used by different research communities. This glossary will provide a framework to ensure consistent use of key terms in all publications arising from RUSTED-related activities.

ToR 2

A set of Standard Operating Procedures (SOPs) for commonly used aerosol leaching schemes will result from the ongoing aerosol trace element solubility intercomparison study being led by Mingjin Tang (Guangzhou Institute of Geochemistry, China). The intercomparison work has now produced all necessary data and reached the stage of data interpretation. Solubility obtained by different laboratories and using different leaching techniques are being compared to assess the error existing in the existing literature (and the associated observation-derived error included in models).
As a result of the intercomparison and discussions within RUSTED, it has become clear that it is neither practical, nor appropriate, to recommend just one leaching method. Rather, it is important that we standardize the most commonly used methods and are aware of the differences in fractional solubility that arise directly from the use of different methods.

ToR 3

This ToR will investigate the wealth of chemical data produced at the same time as aerosol solubility data for bioactive elements in the context of exploring the nature of the controls on aerosol iron solubility. The database, the intercomparison study results and the literature review are all key tools for visualizing the available data to probe this question. An important starting point for this will be to revisit the publications from Sholkovitz et al. (2009, 2012) in light of 10+ years of advances in the study of the nature of aerosol iron solubility. Work on this ToR is not scheduled until mid 2025.

ToR 4

This ToR will validate the atmospheric model output with the dataset from ToR 3. A small group meeting was held for some members at AGU 2023, December 2023, plus some modelers (non-members). A protocol of long-term historical simulations was discussed. The validated deposition data will be used by marine biogeochemical modelers. Meeting with FeMIP (marine biogeochemical modelers) will be held in November 2024 in Goa, India alongside the SOLAS Open Science Conference event.

5. WG activities planned for the coming year. Limit 500 words

Ongoing :

- The RUSTED Special Issue is receiving manuscript submission
- The Inter-comparison study sub-group is processing solubility data obtained from 8 international laboratories with the aim to assess the variability (and source of variability) in iron solubility measurement published in the literature.

November :

- RUSTED ECR workshop
- RUSTED annual meeting (hybrid)
- Discussion with FeMIP about future joint modeling work

- Discussion session at the SOLAS OSC24

March (tentative date) :
- Inter comparison study manuscript submission

Summer2025 (tentative date) :
- RUSTED community workshop in Asheville, North Carolina (TBC)

6. Is the group having difficulties expected in achieving terms of reference or meeting original time schedule? If so, why, and what is being done to address the difficulties Limit 200 words

No difficulty was identified to date
The inter-comparison study was delayed due to late submission of the requested data by 2 laboratories involved ; data has now been received and is currently processed and interpreted
The review article has been delayed due to personal leave of the sub-group coordinator ; drafting of this manuscript has now resumed.

7. Any special comments or requests to SCOR. Limit 100 words.

Additional information can be submitted and may be posted at the SCOR Annual Meeting webpage at the discretion of the SCOR Executive Committee Reporter for the WG and the SCOR Secretariat.