



GESAMP

Joint Group of Experts on the
Scientific Aspects of Marine
Environmental Protection

GESAMP 49/4/2
20 July 2022
ENGLISH ONLY

49th session
Agenda item 4

PLANNING OF GESAMP ACTIVITIES:

THE ATMOSPHERIC INPUT OF CHEMICALS TO THE OCEANS

Report of the Co-Chairs of Working Group 38

1 During the past year GESAMP WG 38 has focused its attention on the following four areas: 1) Completion of a paper published in Nature resulting from the GESAMP WG 38 and WG 40 joint workshop on microplastics and nanoplastics in the marine-atmosphere environment; 2) Continuing development of a workshop in South Africa on the ocean management and policy implications of the air/sea exchange of nutrients; 3) Carrying out other WG activities; and 4) publishing results from the previous WG 38 workshops. We also outline our plans for WG 38 activities for 2022-2023.

WG 38 Activities during 2021/2022

Publication on the Atmospheric Transport of Microplastics to and from the Ocean

2 WG 38, in cooperation with GESAMP WG 40, carried out a virtual “**Workshop on the atmospheric transport of microplastics to and from the ocean**” from 17 to 19 November, 2020. The Terms of Reference for the workshop were as follows:

- .1 Identification of our current understanding and quantitative estimation of the major sources and types of atmospheric microplastics, their atmospheric transport paths and their inputs to and emissions from the global ocean; and
- .2 Development of guidelines on appropriate future atmospheric and marine sampling and measurement methods and strategies, to enable more accurate estimations of the above to be made.

3 Twenty-nine individuals from fourteen nations who have had experience with atmospheric and oceanic microplastics or with air/sea exchange of material participated in the three-day workshop.

4 As a result of the workshop a detailed review paper was published by Nature ‘Reviews – Earth Environment’ in May 2022, with Deonie and Steve Allen as the lead authors, also being among the leaders in the measurement of microplastics in the atmosphere/ocean system. The paper indicates that atmospheric transport may indeed be an important, and previously little considered, route by which microplastics reach the ocean. The sources of these atmospherically transported microplastics are both direct emissions and also the fragmentation, resuspension and redeposition (possibly many times) of plastics already released into the environment, meaning that emission control alone will not address this issue. Microplastics currently in the ocean may also be emitted into the atmosphere via air-sea exchange processes and transported back to land. The paper goes on to propose a cost-effective global strategy to better quantify the role of atmospheric cycling of microplastics by building on existing sampling networks of the Global Atmosphere Watch (GAW) Programme of the World Meteorological Organization. The working

group expects to develop a report on this workshop for the GESAMP Reports and Studies series.

Continuing development of a workshop on the ocean management and policy implications of the air/sea exchange of chemicals

5 As described in the 2021 report of WG 38, plans have been developed, funds have been obtained from several UN agencies and from SOLAS, and individuals have been invited for a workshop that was originally to be held in October 2020 at Nelson Mandela University, Gqeberha (formerly Port Elizabeth), South Africa. This workshop is titled "Potential role of atmospheric deposition in driving ocean productivity in the Southwest Indian Ocean".

6 Unfortunately, due to COVID-19, this in-person workshop was postponed until October 2021, and then postponed again to October 2022. Because a significant part of this workshop involves stakeholders/managers, students, and early career scientists, we do not believe that a virtual format would allow for the efficient engagement of these groups. Thus, we have continued to work toward an in-person/hybrid workshop in South Africa. We are optimistic that conditions will enable this workshop to be carried out in October 2022 in Gqeberha.

7 The workshop will include international and local scientists, managers, and policymakers, and it will evaluate the atmospheric inputs and impacts of nutrients from biomass burning and industrial emissions to the Madagascar Channel and the southwest Indian Ocean, with the following objectives:

- .1 To evaluate the current knowledge of the atmospheric inputs into the southwest Indian Ocean and scientific evidence for the factors that control algal blooms in this region, including the potential role of atmospheric deposition and the confidence in our understanding of these factors;
- .2 To debate the associated potential impacts and management implications with a broader group of stakeholders/experts (including social scientists and economists);
- .3 To present this information to decision-makers at the senior management and policy level for their response and advice on adaptive management steps;
- .4 To identify the feasibility of institutionalizing such an adaptive/dynamic management process at the regional level and linking it into national management processes; and
- .5 In parallel with this process, to introduce young and emerging African scientists to the debate and the science involved and to build capacity for dialogue within the region.

8 The algal blooms in this area of the Indian Ocean are particularly large, although the factors controlling them are not understood. Atmospheric inputs of different constituents may play an important role which needs to be scientifically evaluated. The marine resources of this region also make an important contribution to the diet of many people living on land adjacent to this marine region. The challenge of the workshop will be to connect land management with marine management practices understanding that one has serious implications for the other.

9 Work has begun work on developing scientific questions and assembling relevant information for the workshop and this process will continue ahead of the workshop to try and ensure we all arrive in South Africa well prepared for the work to be done at the workshop. A Zoom call that included all invited scientists was held in late June to begin the development of the background material to be brought to the workshop.

10 As with the other WG38 activities, the aim is to develop and publish promptly the conclusions of the workshop in the open scientific literature. We appreciate the willingness of the sup-

porting UN agencies and SOLAS to continue to support this workshop, even after two postponements.

Other WG 38 Activities

11 For the ninth year in a row WG 38 organized a session on the atmospheric input of chemicals to the ocean for the 2022 European Geosciences Union meeting, held in Vienna, Austria in April – “Air-Sea Exchanges: Impacts on Biogeochemistry and Climate”. A number of oral and poster papers were presented at the session by a combination of WG 38 members and other scientists.

12 Tim Jickells, Robert Duce, Melanie Bergmann and Peter Liss (three of whom are members of WG 38) organized and carried out a session at the American Geophysical Union Fall Meeting in December 2021 in New Orleans, United States, entitled “Microplastics in the Atmosphere and Ocean”.

WG 38 publications in 2021/2022

Peer reviewed publications

Baker, A.R., M. Kanakidou, A. Nenes, et al., 2021, “Changing atmospheric acidity as a modulator of nutrient deposition and ocean biogeochemistry”, *Science Advances*, 7, eabd8800.

Allen, D., S. Allen, S. Abbasi, *et al.*, 2022, “Microplastics and nanoplastics in the marine-atmosphere environment”, *Nature Reviews - Earth Environment*, <https://doi.org/10.1038/s43017-022-00292-x>

GESAMP Reports and Studies

Reports and Studies No. 109, ‘The Changing Acidity of the Global Atmosphere and Ocean and its Impact on Air/Sea Chemical Exchange’, 56p (2022).

WG 38 planning 2022/2023

13 Working Group 38 has planned the following activities for the period 2022/2023:

- .1 Carry out the workshop on the ocean management and policy implications of the air/sea exchange of chemicals at Gqeberha, South Africa in October 2022.
- .2 Develop several peer reviewed papers resulting from the workshop in South Africa; and
- .3 Develop a GESAMP Reports and Studies document on the results from the WG 38/40 workshop on the atmospheric transport of microplastics to and from the ocean.

14 Except for the current support confirmed by several UN agencies for the work of WG 38 in South Africa, no additional support is expected in the coming year.

Action requested of GESAMP

15 GESAMP is invited to review this document and to take action as appropriate.

ANNEX 1

Working Group 38 members

Robert Duce, Co-chair (USA) (M)
Timothy Jickells, Co-chair (United Kingdom) (M)

Sajjad Abbasi, Iran (M) (early career)
Deonie Allen, New Zealand (F)
Katie Altieri, South Africa (F)
Alex Baker, United Kingdom (M)
Cecile Guieu, France (F)
Frances Hopkins, United Kingdom (F)
Akinori Ito, Japan (M)
Maria Kanakidou, Greece (F)
Daoji Li, China (M)
Peter Liss, United Kingdom (M)
Natalie Mahowald, USA (F)
Morgane Perron, Australia/France (F) (early career)
Mike Roberts, South Africa (M)
Monmohan Sarin, India (M)

(Sixteen members, 9 male, 7 female, 2 early career)
