

	FINAL TEAM REPORT	Ref.	TBA
		Date	8-11-2022
		Page 1	No Pages 2

ISSI FINAL TEAM REPORT TEMPLATE:

(This report should not exceed 2 pages)

1. Title of your Team project:

A reference quality model for ocean surface emissivity and backscatter from the microwave to the infrared

2. Objectives:

The objective of this team was to discuss the challenge of developing a community reference-quality ocean emission and reflection model for use across a broad spectral range (microwave (MW) and infrared (IR), and possibly also visible) as well as supporting passive and active satellite remote sensing. The need for this model was identified in various reports and international workshops.

The priorities for the reference model are:

- To be maintained and supported;
- To have traceable uncertainty estimation at each step;
- To be documented with a code freely available to research community;
- To have new science for IR to MW with emissivity and backscattering capability;
- To support passive and active applications.

3. Dates of meetings:

- 20-22 November 2019, physical meeting at ISSI (16 participants)
- 30 April 2020, virtual meeting
- 7-8 December 2020, virtual meeting
- 18 May 2021, virtual meeting
- 21 June 2022, virtual meeting
- 18-19 October 2022, hybrid meeting (10 participants at ISSI)

4. Participants:

Initial team:

- ENGLISH, Stephen, ECMWF, International
- PRIGENT, Catherine, CNRS, LERMA, Observatoire de Paris, France
- JOHNSON, Ben, UCAR/JCSDA, USA
- YUEH, Simon, JPL/NASA, USA
- DINNAT, Emmanuel, GSFC/NASA, USA
- BOUTIN, Jacqueline, CNRS, France
- NEWMAN, Stuart, Met Office, UK
- ANGUELOVA, Magdalena, NRL, USA
- MEISSNER, Thomas, RSS, USA
- KAZUMORI, Masahiro, JMA, Japan
- WENG, Fuzhong, LSW/CMA, China

Other members have been coopted since: Mike Bettenhausen (NRL, USA), Ad Stoffelen (KNMI, Netherlands), Christophe Accadia (EUMETSAT, International), James Hocking (Met Office, UK), Susanne Crewell (Uni Koeln, Germany), Jacob Hoyer (DMI,

	FINAL TEAM REPORT	Ref.	TBA
		Date	8-11-2022
		Page 2	No Pages 2

Denmark), Nick Nalli (NOAA, USA), Craig Donlon (ESA, international), Saleh Abdalla (ECMWF, international), Heather Lawrence (Met Office, UK), Mario Echeverri Bautista (KNMI, Netherland), Carlos Jimenez (Estellus, France).

5. Assessment of the Team activities; highlights:

The team met on several occasions, physically or virtually, and reached a consensus for the selection a community reference-quality ocean emission and reflection model PARMIO (Passive and Active Reference Microwave to Infrared Ocean). PARMIO capacity has been extensively tested for passive microwave applications, by comparisons with satellite observations, and an optimum configuration of the code has been set up. A fast version of the code (SURFEM-Ocean) has been developed for microwave emissivity and is already implemented in the RTTOV generic radiative transfer community model, widely used in Numerical Weather Prediction centers. PARMIO has also been evaluated in the infrared: some adjustments have been made and there are also plans to develop a fast version for incorporation in RTTOV. Preliminary tests have been conducted for active microwaves applications, but the expected accuracy has not been reached and further evaluation and tuning of the code will have to be performed.

The PARMIO code is documented and will be publicly available very soon through a repository, with an open source license. Its maintenance and support are secured for the coming years.

6. Outcome in relation to the objectives:

- A community model PARMIO (Passive and Active Reference Microwave to Infrared Ocean), to be made publicly available soon.
- A fast version of this model for passive microwaves, SURFEM-Ocean, for distribution with the community code RTTOV 13.2 in November this year.
- *Plans for the developments of a fast IR version of PARMIO*

7. Publications resulting from the Team work: (only publications resulting from the team work including acknowledgment to ISSI)

- A meeting paper in BAMS (English et al., Reference-quality emission and backscatter modeling for the ocean, doi: 10.175/BAMS-D-20-0085.1, 2020).
- A paper to be submitted to JGR Ocean within the next weeks (Kilic et al., Development of the SURface Fast Emissivity Model for Ocean (SURFEM-Ocean) based on the PARMIO radiative transfer model).
- *Plans for a second meeting paper in BAMS (Emmanuel Dinna as a lead)*
- *Plans for a general PARMIO paper, illustrating its applicability to passive microwaves, active microwaves, and infrared (Emmanuel Dinnat as a lead)*