RAdiative transfer Model Intercomparison (RAMI)

Widlowski *et al.* (2008) RAMI On-line Model Checker (ROMC): A web-based benchmarking facility for canopy reflectance models. *Remote Sensing of Environment*, **112**: 1144-1150

Level 1

Key points:

- RAMI provides a platform for the systematic, open and fair comparison of canopy RT models with particular focus on the accurate representation of the underlying physics.
- RAMI documents the performance and consistency of RT models (e.g. energy conservation and absolute bias).
- RAMI builds 'surrogate truth' datasets from the simulations of "credible" RT models. These serve as a reference standard in a web-based model benchmarking facility.

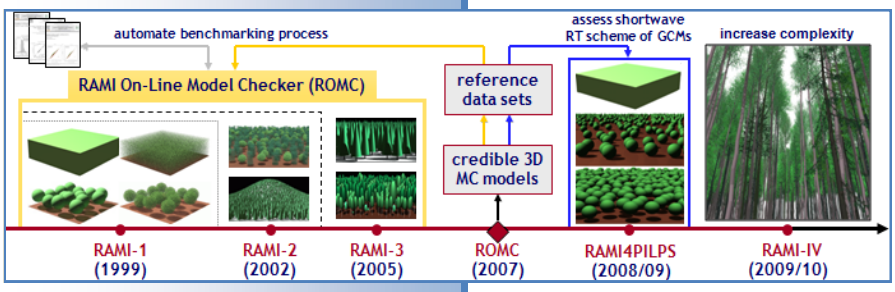

Figure 1. Timeline of RAMI activities; 2007 saw the introduction of RAMI Online Model Checker (ROMC) in which users can debug or validate their models.

For more information on RAMI please contact Jean-Luc Widlowski (jean-luc.widlowski AT jrc.ec.europa.eu) or visit http://rami-benchmark.jrc.ec.europa.eu/.

Executive summary

The European Commission funded RAdiative transfer Model Intercomparison (RAMI) exercise is designed to systematically assess the quality of canopy radiative transfer (RT) models that are used, for example, in the development of satellite retrieval algorithms for biophysical essential climate variables (ECVs). The purpose of this effort is to document the quality of canopy RT models in order to benefit their development, provide users with fitness-for-purpose information and allow a means of justifying their usage in research projects and proposals.

Modelling the transfer of radiation through vegetation canopies is essential for understanding the radiation balance at the Earth's surface. Such information can ultimately be used to quantitatively assess vegetation health and chemical cycles (e.g. carbon, nitrogen, etc.) as well as in the design of retrieval algorithms and vegetation-focused satellite missions.

The complexity of vegetated ecosystems means that neither the various input parameters required by canopy RT models nor the 'true value' of their simulated quantities can be measured accurately in the field. Compounding this is a lack of distinct validation criteria for developers and fitness-for-purpose information for users. The RAMI project overcomes these limitations by creating synthetic plant environments where the structural and spectral characteristics as well as the incoming radiation properties are all specified. Special care is taken to include test cases for which analytical reference solutions (i.e. the truth) are available. The models are tested in a number of exercises in which they simulate parameters of interest (e.g. albedo, reflectance, etc.) based on the specified canopy scenarios. The results of these exercises are collected, analysed and published in the scientific literature.

RAMI provides information which may be used to select models based on their ability in different test scenarios, as well as giving feedback to the creators of the models as to where improvements should focus on. Since its inception, RAMI has identified a series of "credible" 3D RT models, developed a "surrogate truth" reference dataset, pioneered the use of ISO standards for model verification, and built a web-based benchmarking facility for the autonomous and quasi-real time verification of canopy RT models.