D5.1 Production of LES integration in different configurations

Grant Agreement number	675675
Project Acronym	COMPLETE
Project Title	Cloud-MicroPhysics-Turbulence-Telemetry
Funding Scheme	Marie Sklodowska Curie Actions – ITN - ETN
Version date of the Annex I against which the assessment will be made	29/05/2017
Start date of the project	01/06/2016
Due date of the deliverable	February 2018
Actual date of delivery	May 2018
Lead beneficiary	LMD
Dissemination level of the deliverable	Public

Project coordinator's scientific representative

Prof. Daniela Tordella
Politecnico di Torino
DISAT, Department of Applied Science and Technology

Phone: 0039 011 090 6812
E-mail: daniela.tordella@polito.it, complete-network@polito.it

Project website: https://www.complete-h2020network.eu/

Deliverable D5.1 Computation of Lagrangian trajectories from LES

The aim of the first year of work was mainly to get the ESR "up and running" and to perform a battery of model simulations that constitute the object of the deliverable D5.1.

The ESR has started the work in a very constructive way, and the first period of 1) bibliographic work, and 2) of learning to use the Large Eddy Simulation code has been completed earlier than predicted. The model chosen is SAM (Khairoutdinov and Randall (2003), see also http://rossby.msrc.sunysb.edu/~marat/SAM.html) a complete and useful tool to study detailed cloud processes, that can be run at high resolution.

The definition of the scientific goal of the first year has been discussed in the meantime, with the full participation of the ESR. The scientific rationale is more extensively described in the first year report. Briefly, the object is to study the tendency of convective clouds to aggregate at a scale larger than the single convective cell (wing et al 2017). This tendency is of great importance because it can modify the large scale effect of clouds on the environment, and because Global Climate Models still have difficulties reproducing this phenomenon. We concentrate on the specific problem of the behavior of the aggregation in presence of a surface inhomogeneity, such as an island or a localized Sea Surface Temperature (SST) anomaly similar to those created by ocean eddies (a *hotspot*).

For this reason a battery of LES integrations have been performed. We have explored different domain sizes and Hotspot sizes. This is done maintaining a cloud-resolving horizontal resolution of 10 km.

In the following table the list of integration is given with details. It is also indicated whether the integration gave rise to cloud aggreagation or not. The output data of the integrations are available upon request.

Khairoutdinov, M. F., and D. A. Randall, 2006: Hddigh-resolution simulation of shallow-to-deep convection transition over land. *J. Atmos. Sci*., **63**, 3421–3436.

Wing AA, Emanuel K, Holloway CE, Muller C (2017) Convective self-aggregation in numerical simulations: a review. Surv Geophys. doi: 10.1007/s10712-017-9408-4

	Domain (km^2)	SST (K)	HS[1] radius (km)	dT[2]	Radiation	Aggregation
Ocean	288^2, 576^2	300,305	-	-	full radiation	yes
Ocean	288^2, 576^2	300,305	-	-	homogenized radiation	no
Hotspot	288^2	300	30 - 90	2,3,5	full radiation	yes
Hotspot	576^2	300	30 - 285	2,3,5	full radiation	yes
Hotspot	288^2	300	30 - 90	5	homogenized radiation	yes for $R \geq 50$ km
Hotspot	576^2	300	30 - 285	2	homogenized radiation	yes for $R \geq 120$ km
Hotspot	576^2	300	30 - 285	5	homogenized radiation	yes for $R \geq 70$ km