SPECIAL PROJECT PROGRESS REPORT

All the following mandatory information needs to be provided. The length should *reflect the complexity and duration* of the project.

Reporting year	2026
Project Title:	I-DREAM-IT: a new convection-permitting limited-area atmospheric reanalysis over Italy using ICON-DREAM reanalysis as boundary conditions and the ICON-2I meteorological model
Computer Project Account:	SPITGIOR
Principal Investigator(s):	Antonio Giordani
Affiliation:	University of Bologna, Department of Physics and Astronomy, ItaliaMeteo National Agency for Meteorology and Climate
Name of ECMWF scientist(s) collaborating to the project (if applicable)	…… ……
Start date of the project:	January 2026
Expected end date:	December 2028

Computer resources allocated/used for the current year and the previous one

(if applicable)

Please answer for all project resources

		Previous year		Current year	
		Allocated	Used	Allocated	Used
High Performance Computing Facility	(units)			160 000 000	2 303 261
Data storage capacity	(Gbytes)			25000	10

Summary of project objectives (10 lines max)

The SPITGIOR project, partly funded by the TRIGGER European initiative, aims to produce a new high-resolution ensemble-based regional reanalysis dataset over Italy through collaboration among the University of Bologna, ARPAE, LAMMA, and AIM. The dataset will be generated using the ICON-2I NWP model with 20+1 ensemble members at ~2.2 km horizontal resolution and 65 terrain-following vertical levels. Data assimilation employs a LETKF scheme for conventional observations (SYNOP, TEMP, AIREP) and latent heat nudging (LHN) of radar-estimated precipitation fields from Italian civil protection network. Boundary conditions are provided by the ICON-DREAM reanalysis (DWD), running ICON-EU at ~6.5 km (deterministic) and ~20 km (ensemble). Three-dimensional hourly model outputs will cover the initial period of 2010-2025.

Summary of problems encountered (10 lines max)

Initial challenges involved translating job scheduling configurations, natively implemented on CINECA's HPCs, to the ATOS system, successfully resolved through iterative testing. These included adaptations of the ecFlow suite, SLURM job configuration, software dependencies, and Arkimet data handling procedures. A more significant issue regarding SST analysis ingestion during the 00 UTC cycle of ICON model remains under investigation and has slightly delayed the transition to operational production. Despite this, a 96-hour reanalysis test simulation have been completed on ATOS, enabling a preliminary assessment of computational and storage requirements (see table).

	1 day	**1 year**	**15 years**
HPC SBUs	240 000	87.6 M	1314 M
Accumulated data storage	59 GB	22 TB	320 TB
Computing time	8 hours	121 days	600 days*

*Assuming three parallel production streams.

Compared to the estimates provided in the initial SP proposal, both the computational cost (SBUs) and the projected storage requirements have increased substantially following the first tests on ATOS. Nevertheless, the currently allocated resources remain sufficient for the planned activities in the near term. A further evaluation of resource requirements will be carried out once the production system is fully operational and the final strategy for parallel reanalysis streams has been established.

Summary of plans for the continuation of the project (10 lines max)

During the remainder of 2026, work will focus on completing the implementation of the remaining system components, including correct SST analysis ingestion, radar-based LHN, and activation of the TERRA_URB land-surface scheme. Two dedicated case studies will be performed to evaluate system performance against its driver (ICON-DREAM) and guide final configuration choices. The objective is to achieve a fully operational production suite by the end of the year. Once operational readiness has been demonstrated, the production of the last five years of the reanalysis (2020–2025), including an initial period for model spinup, will begin. In parallel, strategies for extending the dataset back to 2010 will be assessed, including the deployment of additional ecFlow suites to enable multiple concurrent production streams.

List of publications/reports from the project with complete references

Conferences:

- Giordani, A., Capecchi, V., Gastaldo, T., Poli, V., Vittorioso, F., Di Sabatino, S., and Cacciamani, C.: "*Towards ITINERE: a new ICON-based reanalysis for Italy*", Poster contribution at ICCARUS 2026 (ICON/COSMO/CLM/ART User Seminar), DWD Headquarters, Offenbach, Germany, 16-20 March 2026.

Summary of results

The first months of the project were devoted to assembling the operational framework required for the production of the reanalysis system. This included the installation and configuration of the complete software stack (NWPRun, NWPConf, ICON, ICON-Tools, DACE) and the development of a dedicated ecFlow suite derived from the operational workflow currently used at ARPAE for running ICON-2I model forecasts. Significant adaptations were required to ensure compatibility with the ECMWF ATOS environment, including modifications to Arkimet dispatch procedures, NWPRun/NWPConf configuration tuning, and SLURM job directive refinement. A preprocessing workflow was established both for ICON-DREAM boundary/initial conditions (from DWD) and for conventional observations (SYNOP, TEMP, AIREP) ingestion into KENDA data assimilation system.

The first simulation for a selected case study (the Marche flood of September 2022) has started, demonstrating the correct interaction of the main workflow components and providing information on computational performance, storage requirements, and operational scalability. The next step will be the completion of the first case study in order to perform a comparative verification analysis against the driving ICON-DREAM reanalysis. This assessment will provide the first robust evaluation of the system’s added value and performance, that will serve as the basis for the transition to the operational production of the reanalysis.