

Partnerships to advance Earth System Predictions



 ECMWF

ECMWF Strategy: Science and technology goals for 2030

A seamless Ensemble Earth system
maximising the use of current and upcoming observations
through consistent and accurate modelling
with realistic water, energy and carbon cycles.

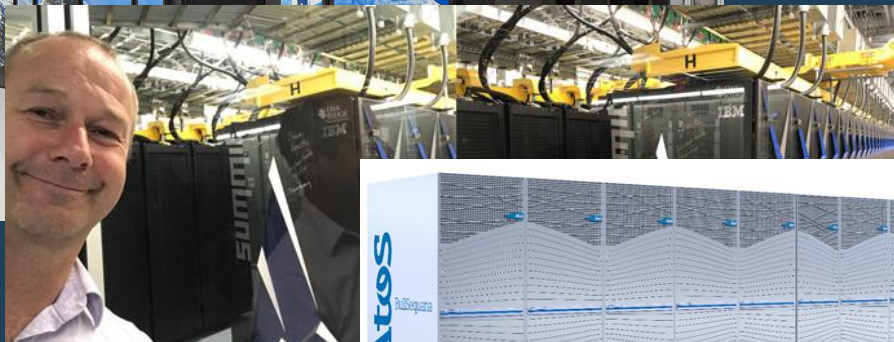
Use of advanced high-performance computing
big data and AI methodologies
to create a Digital Twin of the Earth
with a breakthrough in realism.



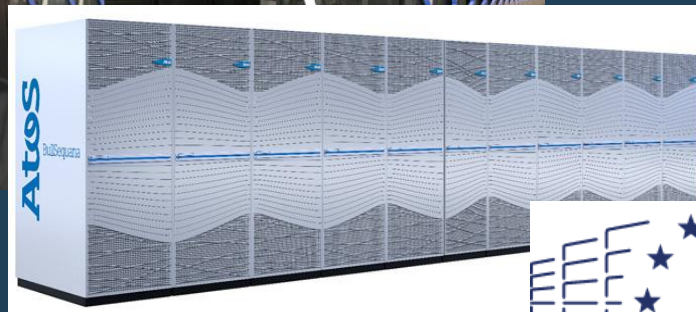
Partnership with HPC centres



PizDaint



Summit



ECMWF's next generation



2020 HPCwire Awards

Readers' Best Use of HPC in Physical Sciences –
ECMWF & ORNL



Wedi et al, 2020



Collaboration with private companies for computing activities

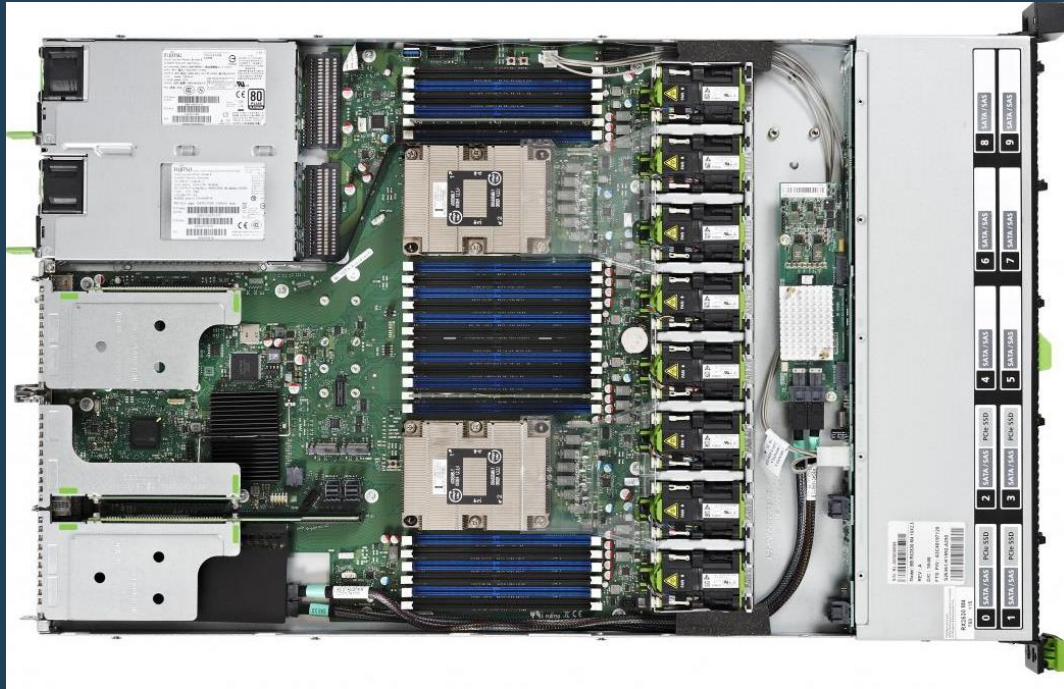
Centre of Excellence in HPC, AI and Quantum Computing for weather and climate with ATOS, supported by AMD, Mellanox, NVIDIA and DDN

First two projects on Machine Learning
and the development of a CPU-GPU-based version of IFS

Project with MAXAR

Contract to run the IFS model on Amazon Web Services cloud computing resources
to test feasibility, scalability and performance

NextGen IO: a successful project to test prototype hardware



INTEL® OPTANE™ DC PERSISTENT MEMORY
CHANGING THE MEMORY AND STORAGE PARADIGM

ECMWF **10X HIGHER BANDWIDTH**
INTO RESULTS DATABASE
VS. CONVENTIONAL STORAGE SYSTEMS
ACCELERATING GLOBAL WEATHER FORECASTING ...
WITH FEWER I/O NODES

ARCITUR **2X SPEED UP**
VS. CONVENTIONAL STORAGE SYSTEMS
REDUCING SIGNIFICANT WRITE OVERHEAD INTO FILE SYSTEM
REDUCING OPENFOAM RUNTIME BY 50%

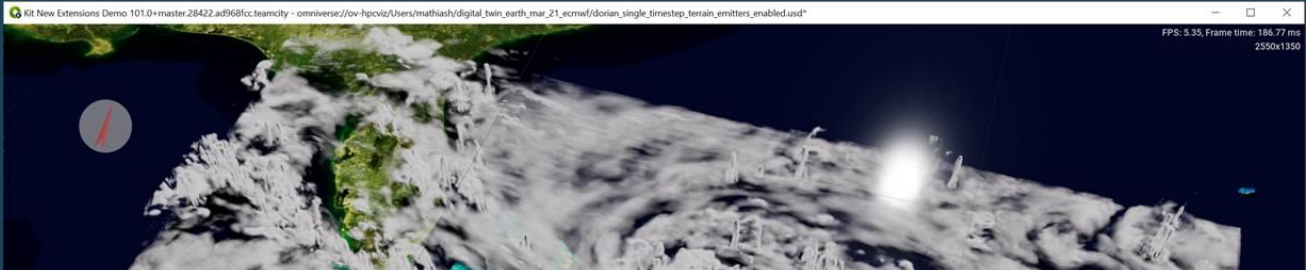
CASTEP **2X HIGHER THROUGHPUT**
ON SAME NUMBER OF NODES
VS. DDR BASED SYSTEMS
ACCELERATING MATERIAL SCIENCE RESEARCH
ACROSS MULTIPLE DOMAINS

Performance results based on testing by EPCC. See slide 18 for system configuration details as provided by EPCC.
The NEXTGenIO project is funded by the European Union's Horizon 2020 Research and Innovation program under Grant Agreement no. 671951

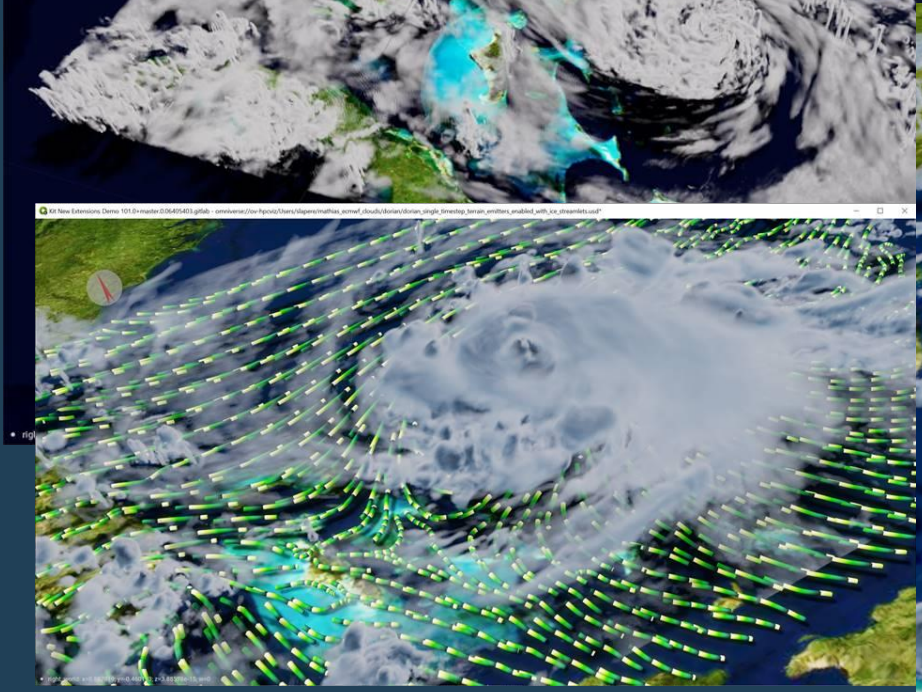
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Partnership with NVIDIA to visualize simulations



4-day global forecast at 1km of Hurricane Dorian in August 2019 on Summit



*Mathias Hummel, Peter Messmer (NVIDIA);
Pedro Maciel (ECMWF)*

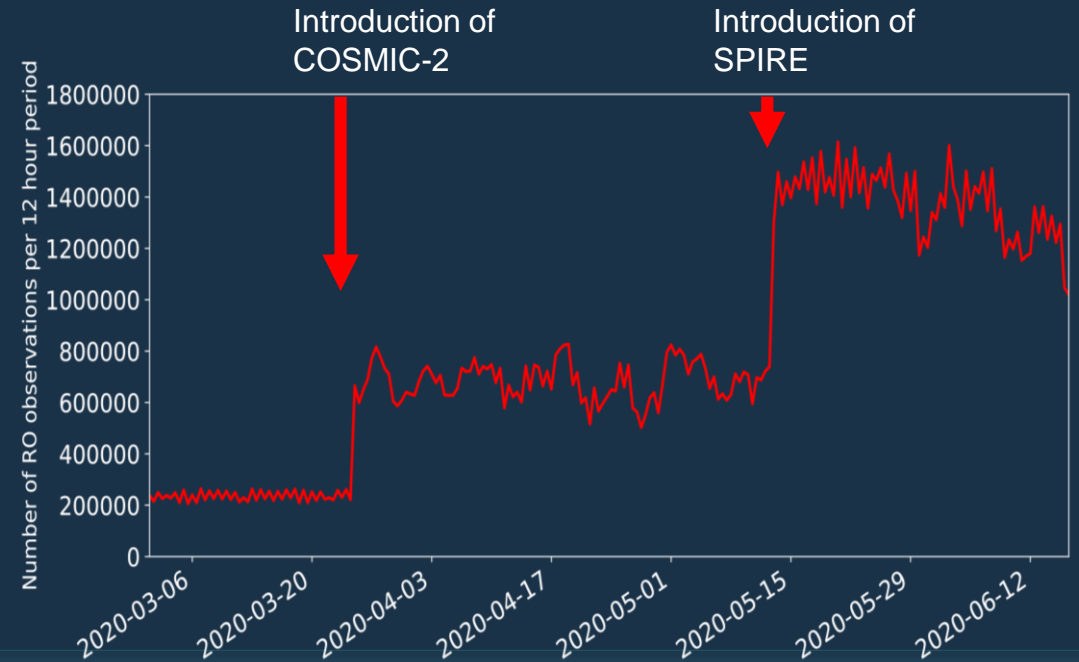


Aircraft data loss: Mitigating the impact through community effort

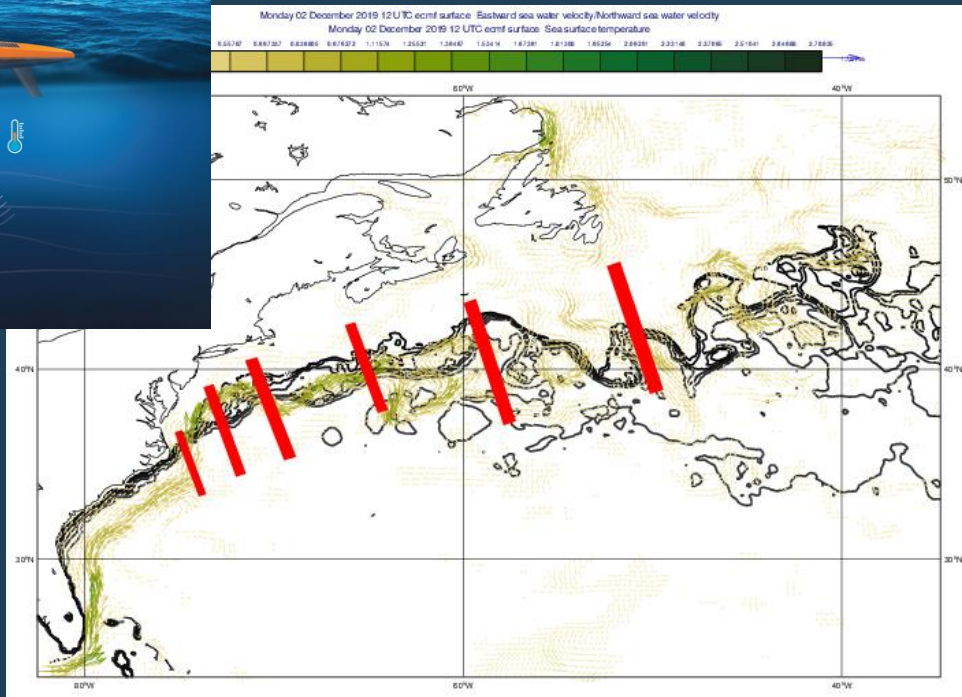
Aircraft data count - Global



Number of GNSS-RO data assimilated



Saildrone mission for improving Earth System Prediction



- Saildrone will provide 6 saildrones for 1 year in a location determined by ECMWF (and useful for the wider community)
- Targeting the Gulf Stream to assess biases which affect medium to long range
- Collaboration with climate scientists looking at air-sea fluxes of carbon
- Funding secured from Google.org Impact Challenge on Climate for the operational support, with others to be found

Satellite observations of the surface of the Gulf Stream.

ECMWF analysis of surface currents.

Proposed corridors of the saildrone mission.



Key messages

- Exciting times ahead in Earth System modelling that will require
 - Major technological developments in HPC, Cloud, AI/ML
 - More observations from satellites, private companies, IoT
- For a step-change in such developments, enhanced partnerships are needed:
 - Member States, WMO, academia
 - Observation providers and co-design with industry



The strength of a common goal