

New Digital Twin for Destination Earth: TerraDT - Digital Twin of Earth System for Cryosphere, Land Surface, and Related Interactions

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Duration: 1.1.2025-01.12.2028 (4 years), Website: www.terraDT.eu

Consortium: 10 partners across Europe (10 countries)



Context – Why new Digital Twin for DestinE is needed?

★ Destination Earth (DestinE) builds Digital Twins (DT) of Earth to support decision making. Particularly Climate change adaptation DT (Climate DT) focusing on high-resolution global climate projections & impact assessments

★ DestinE limitations

- Core climate models (ICON,IFS-NEMO,IFS-FESOM) poorly describe some key components of Earth system
- Adding new components to core climate models challenging
- Only a limited number of impact sectors are represented

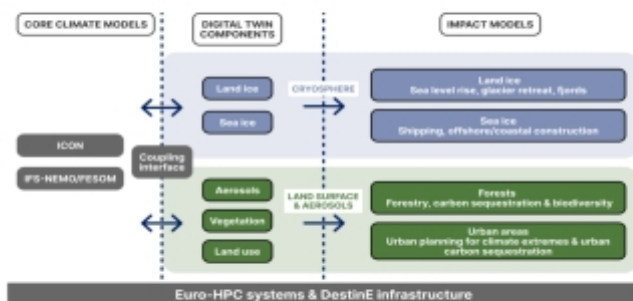
★ TerraDT responds to these needs by developing new Digital Twin components, impact models and modular software infrastructure

★ This results in enhanced DestinE infrastructure providing more reliable and relevant information for climate adaptation and mitigation!

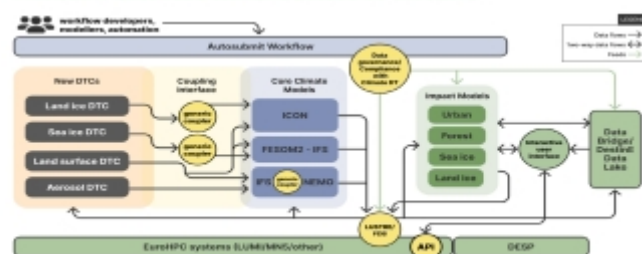
★ Primary objectives of TerraDT are:

- Develop TerraDT to improve climate projections and impact assessments for enhanced decision-making.
- Enhance the DestinE infrastructure by creating a modular, scalable, and interoperable TerraDT platform with advanced software, high-performance computing, and data handling capabilities.
- Foster user uptake by engaging the scientific community and stakeholders in public and private sectors, ensuring a user-centric approach to development and deployment.

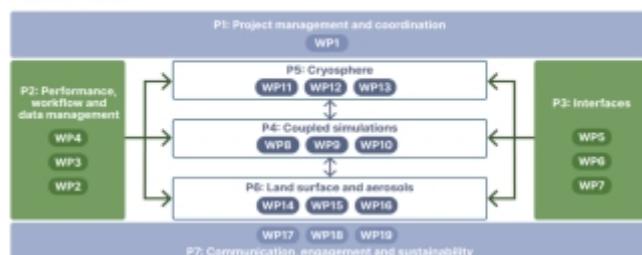
TerraDT components



Workflow Software Infrastructure in TerraDT



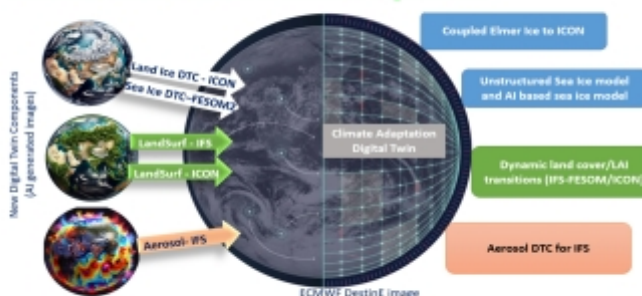
PERT Chart



Technical advancements to ClimateDT Software

- DestinE core climate models development **ICON** **IFS-NEMO** **IFS-FESOM**
- Workflow infrastructure compatible: *seamless integration with existing systems*
- Porting to EuroHPC machines
- Generic coupling Interface: *scalable, interoperable and portable solution for expanding DestinE DTs*

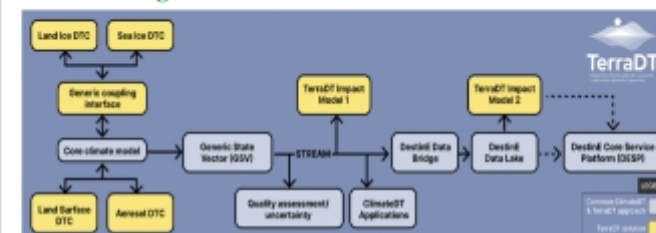
Scientific enhancements to DestinE capabilities



Expand DestinE capabilities to new impact sectors



TerraDT integration to DestinE



TerraDT outcomes

- ★ New Digital Twin Components for land ice, sea ice, land surface and aerosols, each coupled to core climate models
- ★ Impact models linked to land ice, sea ice, forests and urban areas
- ★ Generic coupling interface
- ★ Model performance improvements and data governance & workflow solutions compatible with DestinE
- ★ Multi-decadal coupled simulations with the new DTCs
- ★ User Interface for the new impact models deployed on DestinE service platform

Conclusions

- ★ TerraDT enhances the capabilities of the DestinE core climate models to better represent the Earth system processes
- ★ TerraDT Facilitates DestinE for the interoperability between different software components
- ★ In summary, TerraDT will mark a significant leap forward for DestinE by enhancing the DestinE infrastructure with new scientific and technological capabilities

Acknowledgements

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