ECMWF – DESTINATION EARTH

USING UNREAL ENGINE TO PROMOTE DESTINE DATA

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MOTIVATION

- goal: create content to **promote DestinE data** at (primarily non-scientific) events in the most engaging and impressive way

- **chose Unreal Engine 5**:
    - allows responsive interaction thanks to real-time rendering
    - provides support for photo-realistic graphics

FUNDAMENTAL DESIGN CHOICES (can change in the future)

- local data storage for reliable and fast access
  - no risk of network issues
  - optimal performance achieved by letting Unreal compress the 8bit image files in a format supported by GPU of the target device
  - capable of storing years of data, even on (high-end) mobile devices
- focused on maximizing visual quality for 5km global data with 1km resolution topography
- current strategy loads entire global texture for the best performance
- higher resolution possible for smaller domains
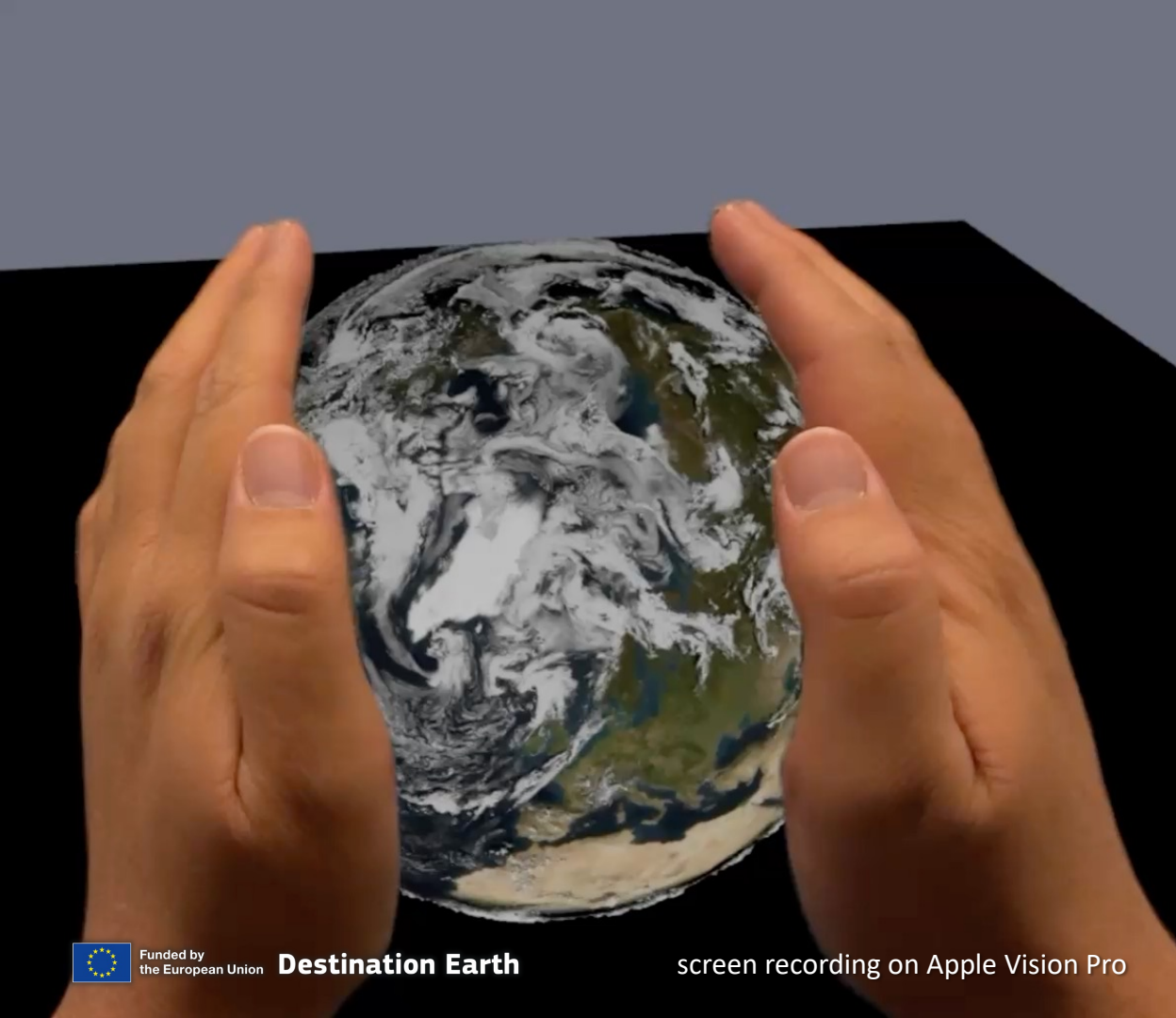
UNREAL ENGINE

CURRENT STATUS

- tested on MacOS, Windows, Linux, iOS, iPadOS

- massive performance improvement: in June rendering video was at 8fps, now up to 25x faster:

device	framerate
MacBook M1 Pro	60 fps
MacBook M3 Max	110-120 fps
- M3 on 4K screen	50 fps
PC with RTX 4090	200-220 fps
iPhone 14 Pro	40-60 fps
iPad Pro 13" (2024)	40-60 fps
iPad Pro 12.9" (2020)	30 fps

- full touch screen and game controller support

Funded by the European Union **Destination Earth**

screen recording on MacBook

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VIRTUAL REALITY

- works on Apple Vision Pro
- 3D mountains and 3D pressure field look stunning!
- limitations:
  - Apple Vision Pro not suitable for large number of users
  - framerate > 45 fps
  - no official support in Unreal for Vision Pro
  - in VisionOS 1: no mixed reality, only fully virtual
  - no support for many nice post-processing effects (bloom, atmosphere, background blur)

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screen recording on Apple Vision Pro

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PLANS

- adding animations for:
  - wind trajectories
  - lightning in thunderstorms
  - aurora
- goal: let people experience impact of weather and climate on their life
  - landing in selected locations on the ground
  - vegetation that responds to our simulations (wind, storms, droughts, floodings, wildfires)
- create something that people can do. Current ideas:
  - finding extreme events as early as possible
  - achieve electricity production by building wind parks
  - take advantage of sun and wind to reach destination with solar powered electric airship

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