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INFORMATIQUE SCIENTIFIQUE & SUPPORT APPLICATIF
SCITAS
SCIENTIFIC IT AND APPLICATION SUPPORT

VIRUP : Project Update

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Winter Meeting
27.01.2025

OUTLINE

- Reminder about what VIRUP is
- Repositories Work in Progress
- Special Dataset type : Cosmological simulations

REMINDER : GOALS

- Originally :
  - Make a VR real-time rendering application
  - Aggregate data from multiple large datasets
  - Help develop an intuition for the sense of scale in the Universe
- Added over the years :
  - Multimodality
  - Pre-rendered movies
  - More complex types of data (volumetric, dynamic, planetary science, etc...)

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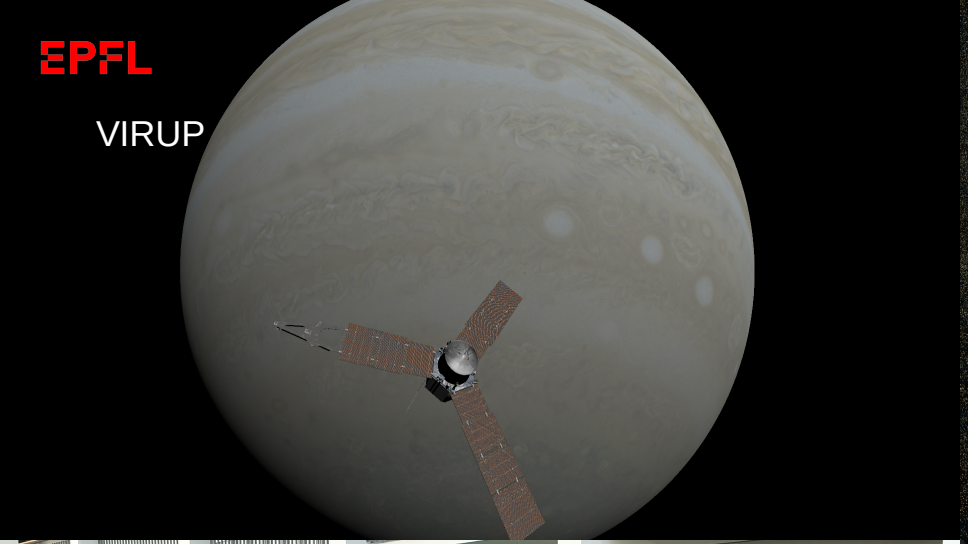
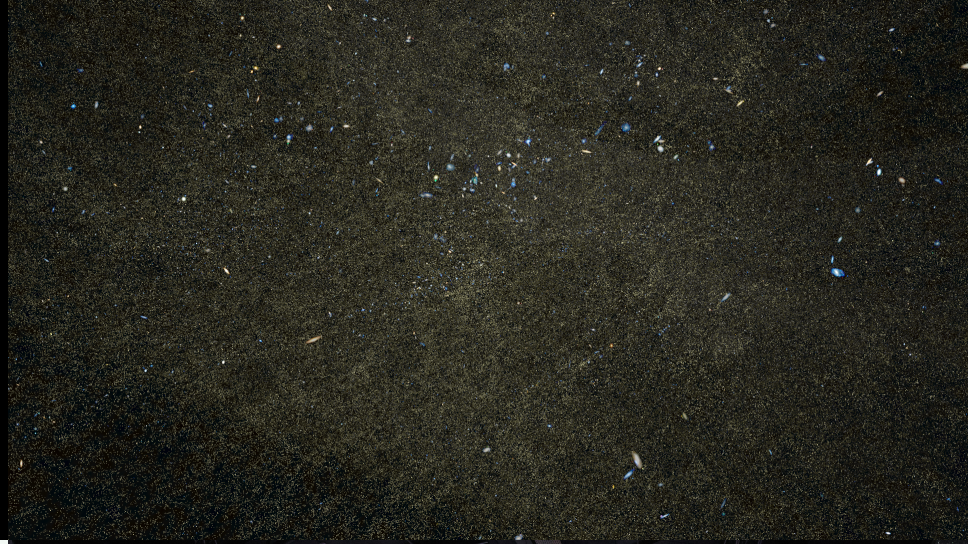
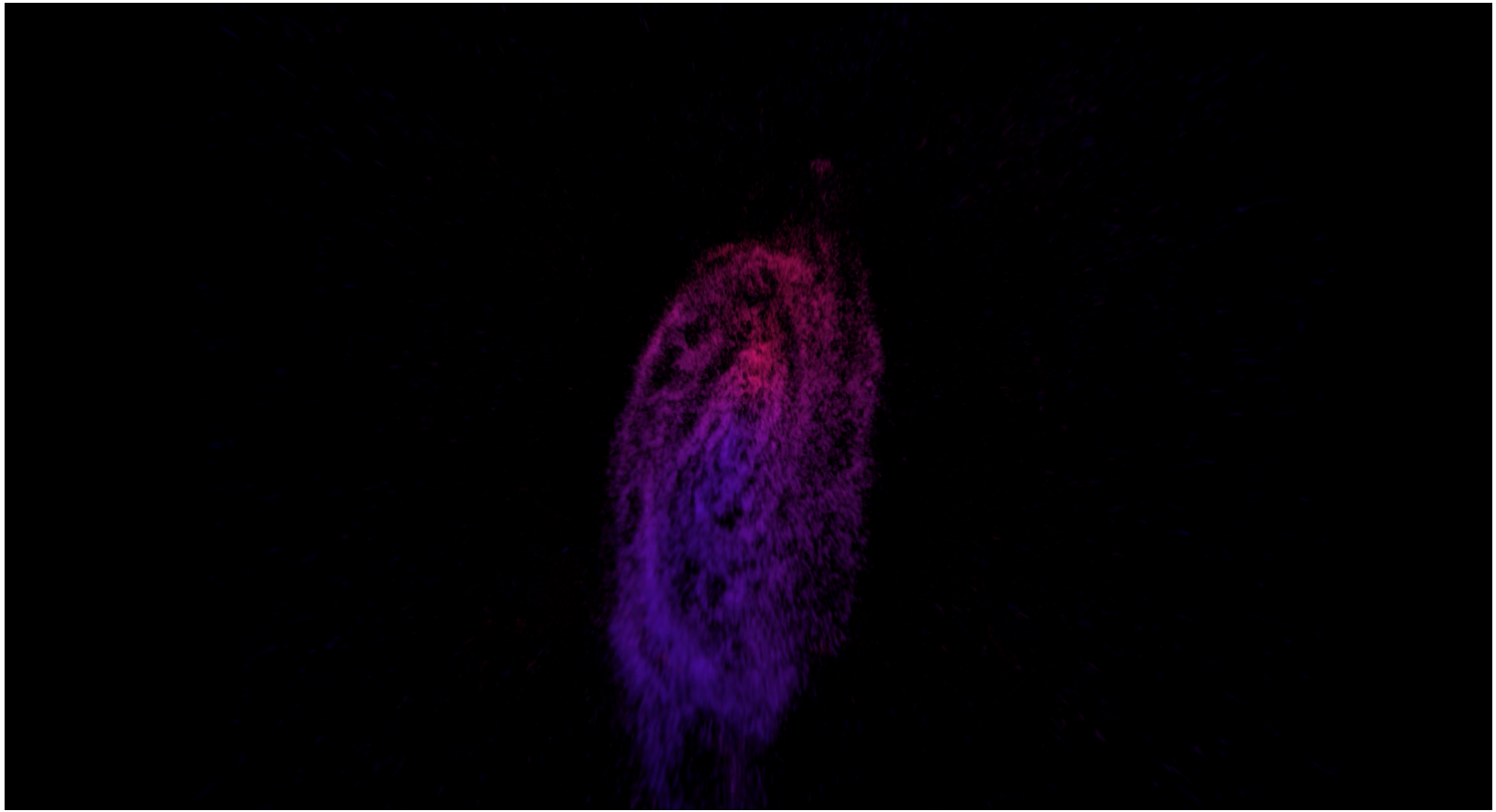
VIRUP





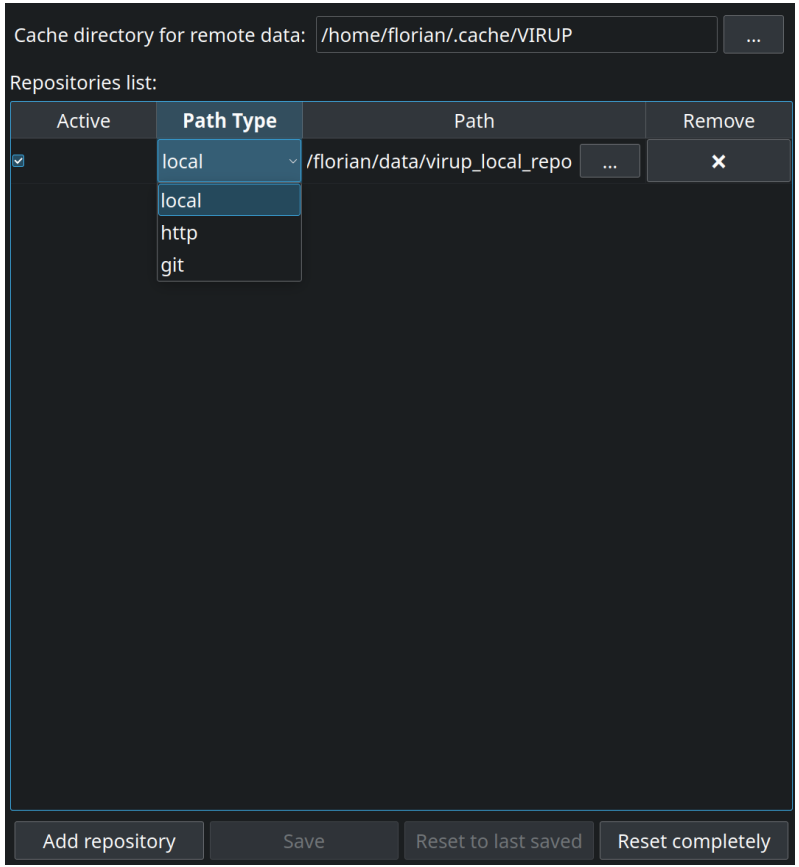
VOLUMETRIC VISUALIZATION



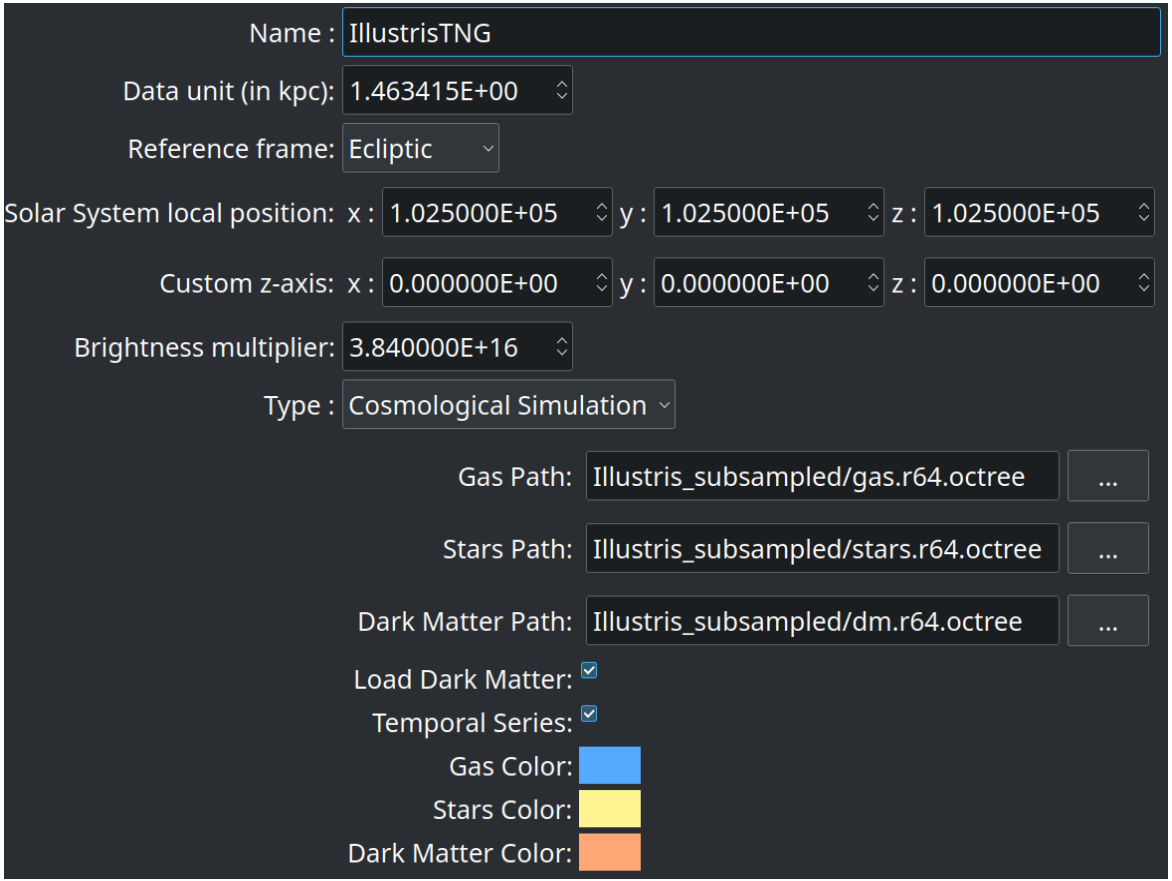
FUTURE

- **Waiting for feedback on** an SNSF Agora proposal with Tanya Petersen and Yves Revaz
  - Focus on putting VIRUP in the hands of as many people as possible
  - Use social media and public events more
  - **Distribute data in a more accessible way to propose more datasets**
  - **Allow scientists to publish their data themselves or use the tool for their own outreach communication**
  - **Experiment with generative AI and voice recognition for automatic guidance through the data**
  - Support even more hardware
  - Dynamic cosmological simulations

REPOSITORIES : REGISTRY



DATASET EXAMPLE : COSMO. SIM.



DATASET EXAMPLE : TEXTURED SPHERE

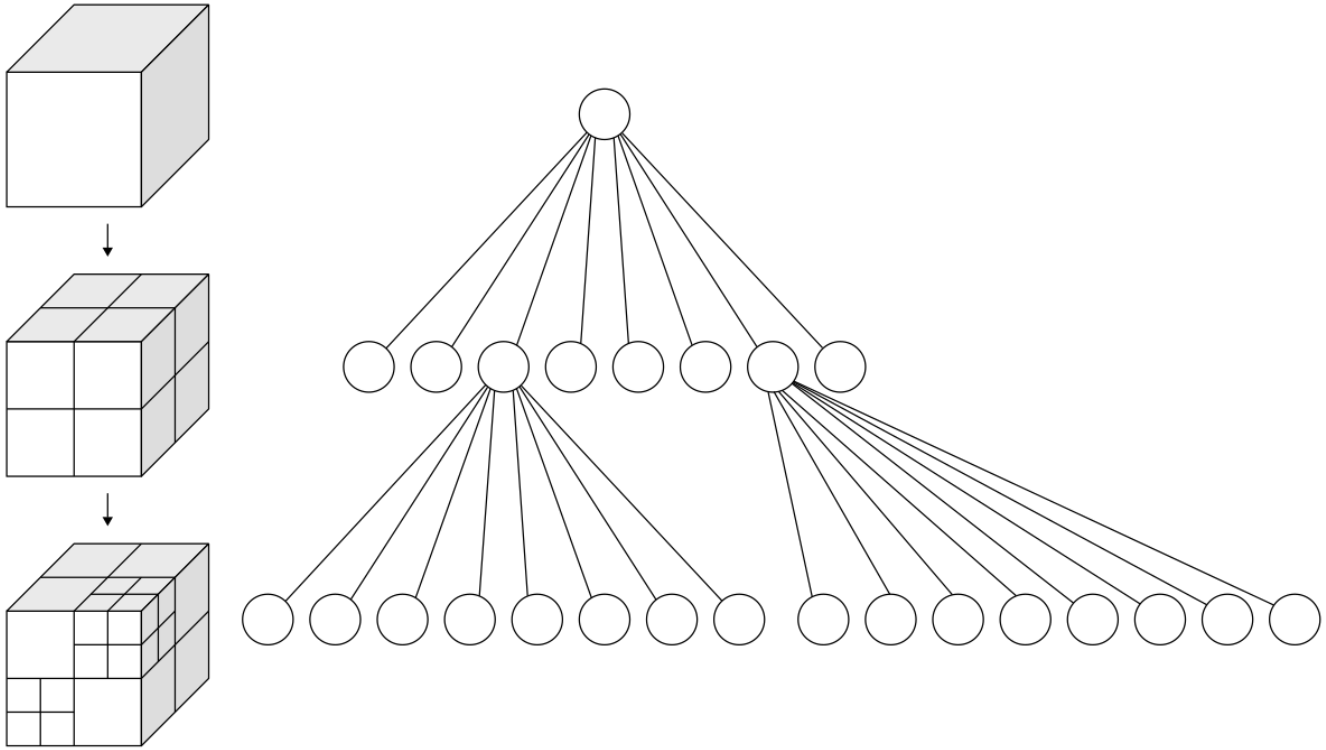
```
version = "1.0"
type = "texsphere"

[universeelement]
name = "Cosmic Microwave Background"
unit = 1.396488e+07
referenceframe = "galactic"
solarsyslocalpos = [0, 0, 0]
customzaxis = [0, 0, 1]
brightnessmul = 1000

[texsphere]
file = "CMB.jpg"
cullfrontfaces = true

```

COSMOLOGICAL SIMULATIONS

- They are usually very large (tens of gigabytes **at least** just for positional data)
- They require acceleration structures to be rendered in real time to only render what is required for the current frame (requires fast loading independently of the storage technology)

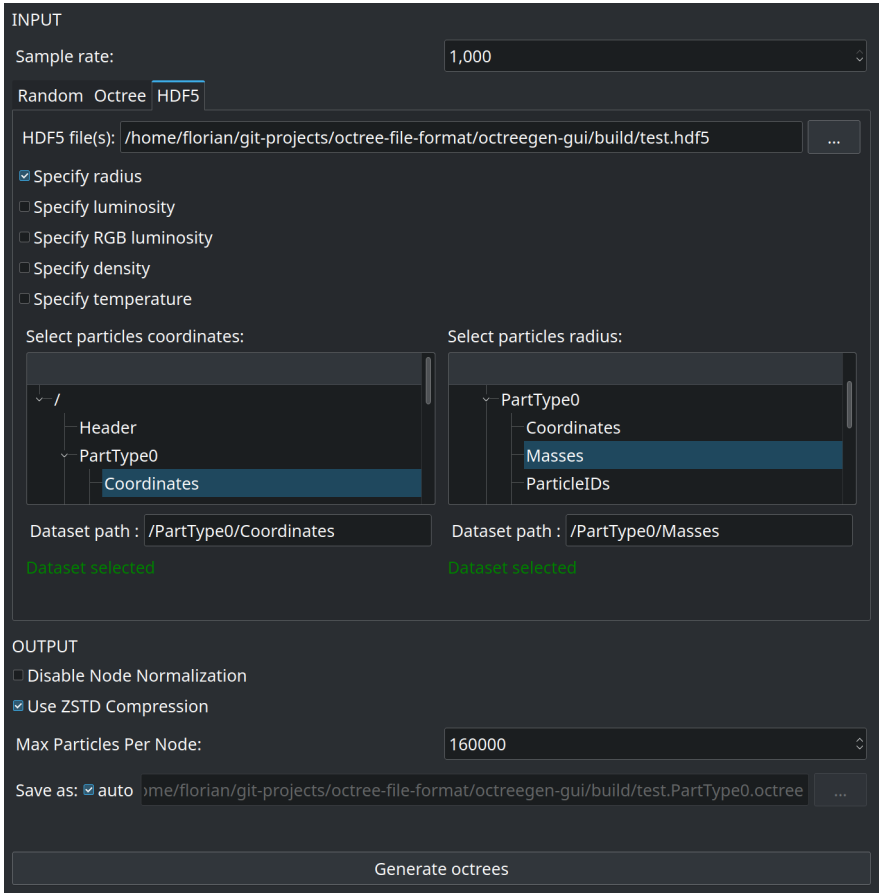
  => We need a preprocessing step

OCTREE ACCELERATION STRUCTURE



Wikipedia/Octree

OCTREEGEN : GUI



OCTREEGEN : CLI

```
~ octreegen generate --input-random 1000000 --output random.octree
Generate :
Input options :
        Sample rate :                         1

Input Type :                                  RANDOM
        Particles number :                    1000000
        Add radius :                          off
        Add lum :                             off
        Add RGB lum :                         off
        Add density :                         off
        Add temperature :                     off

Output options :
        Node normalization :                  on
        zstd compression :                    off
        Max particles per node :              16000

Output :                                      random.octree

Constructing octree :
[▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱] 100%
Writing octree to output file 'random.octree' :
[▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱▱] 100%
Conversion successfull !
~
```

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Thank you !

go.epfl.ch/VIRUP

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