13th 3D GeoInfo Conference, 1–2 October 2018, Delft, The Netherlands

Dynamic 3D visualization of floods: Case of the Netherlands

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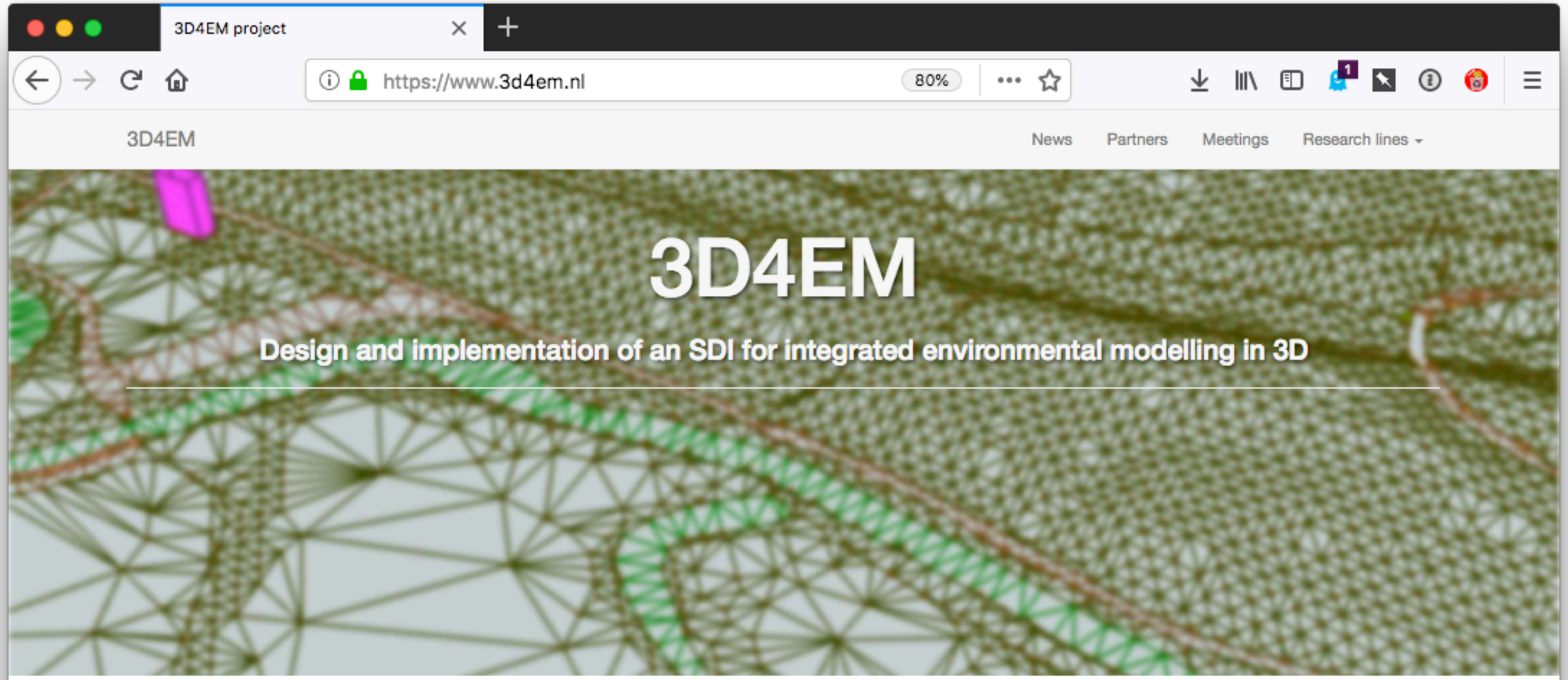
3D Geoinformation group
TU Delft

Part of project about 3D for environment



About

3D4EM is a research project funded by STW in which 14 organisations (universities, governement and companies) are working together to develop a countrywide and scalable 3D information infrastructure (SDI) for integrated 3D environmental modelling. This will enable easy use—and

Part of project about 3D for environment

3D4EM project

https://www.3d4em.nl 80%

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3D4EM

How to visualize floods?

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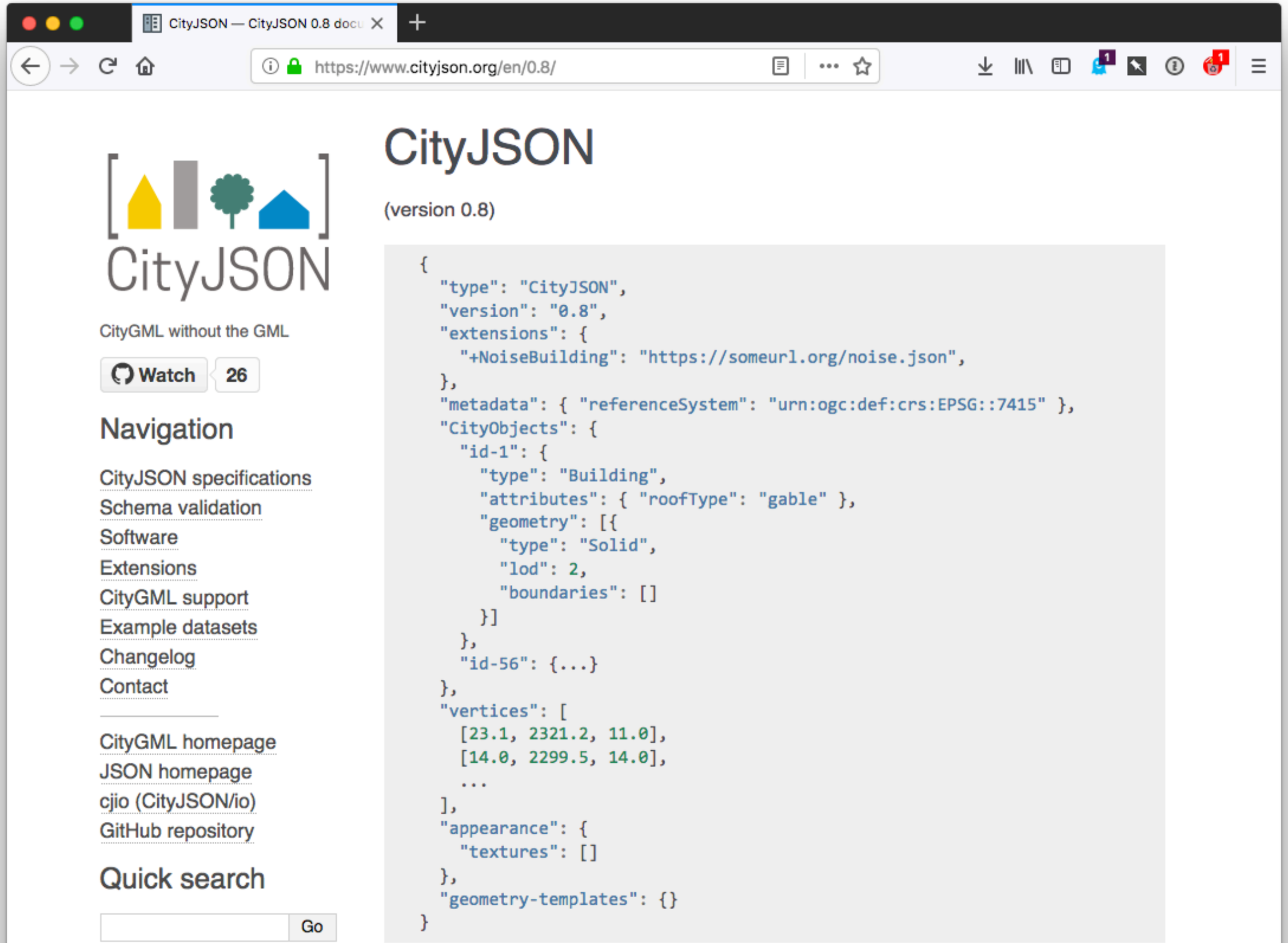
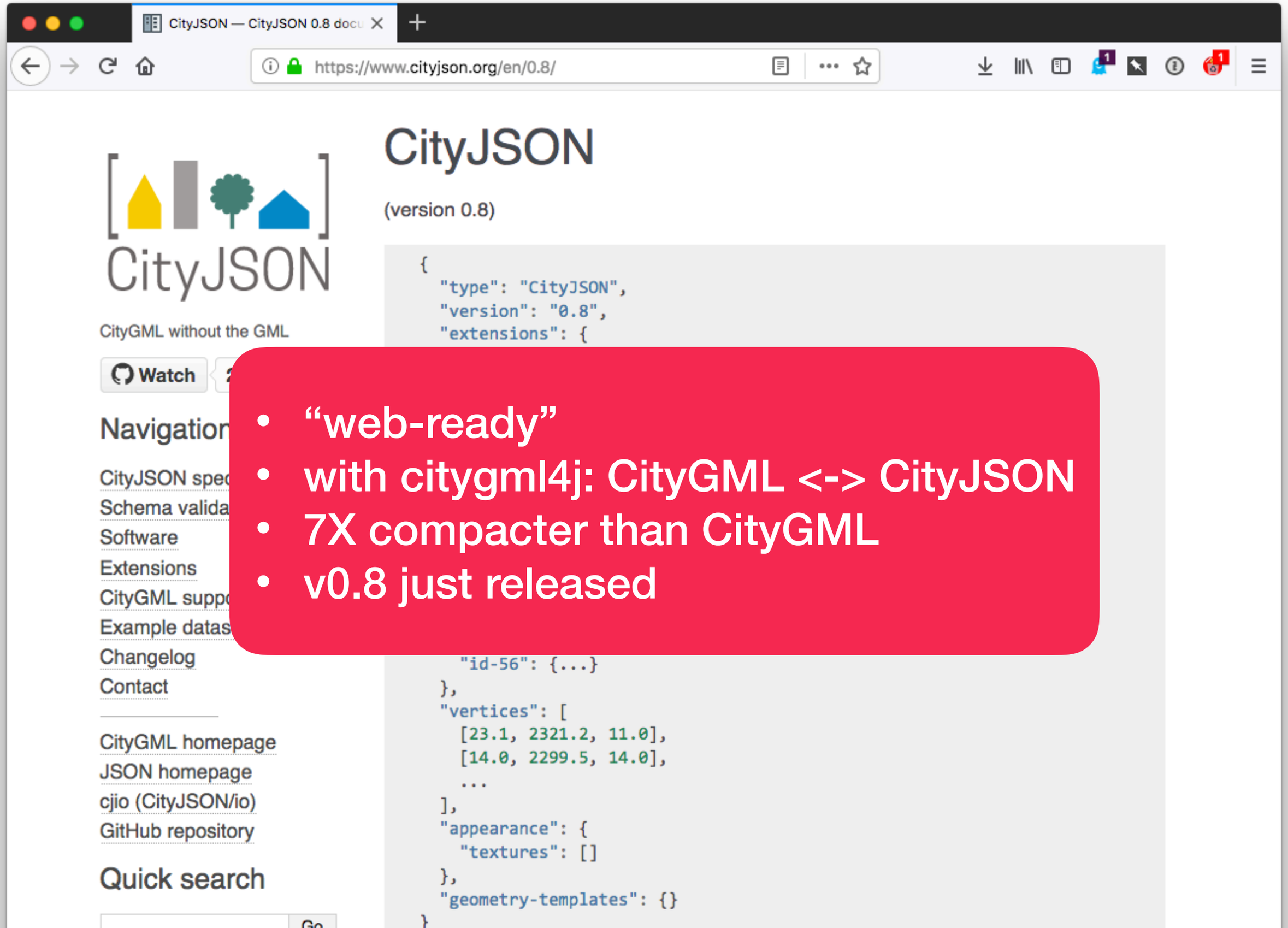
3D visualization standards

Criteria/ Standard	VRML	X3D	COLLADA	KML	OBJ	glTF
Type	XML	XML	XML	XML	Text	JSON
Developer	Web 3D consortium	Web 3D consortium	Khoronos grp	Keyhole Inc., Google	Wavefront technologies	Khoronos grp
Version	2.0	3.3	1.5.0	2.3	-	2.0
Geometry	Primitive geometry types &	Shape and geometry nodes	Mesh, Splines, etc.	Simple feature	Mesh	Mesh (Triangles)
Semantics	X	X	Limited support using <extra> & extensions	X	X	X (Possible using b3dm)
Appearance	✓	✓	✓	✓	✓	✓
LODs	X	X	✓	X	X	✓ (using MSFT_lod extension)

3D city models in CityJSON

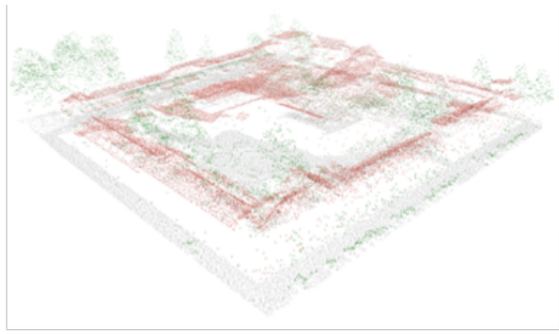


3D city models in CityJSON



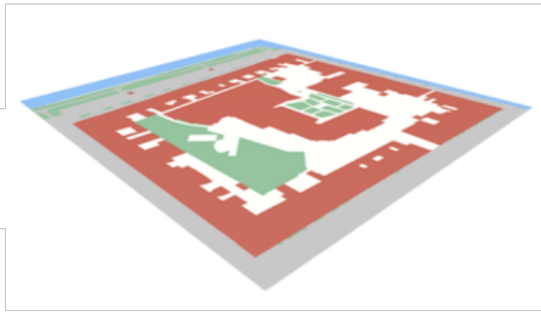
- "web-ready"
- with citygml4j: CityGML <-> CityJSON
- 7X compacter than CityGML
- v0.8 just released

Proposed framework



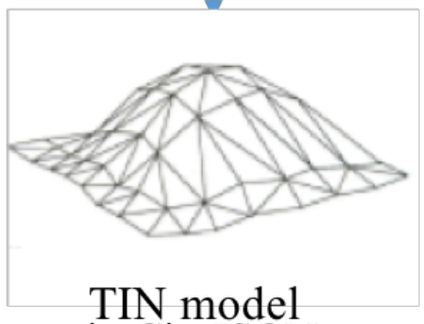
AHN3 Point cloud

+

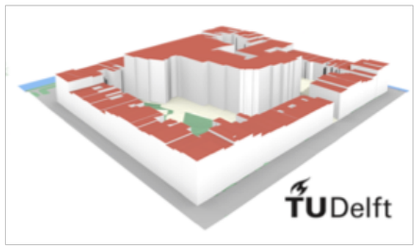


2D BGT

3dfier



TIN model
in CityJSON



3D Building model in CityJSON

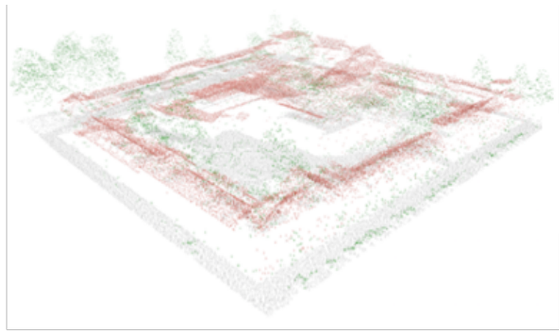
+ Simulation
parameters

CityJSON to glTF
python converter

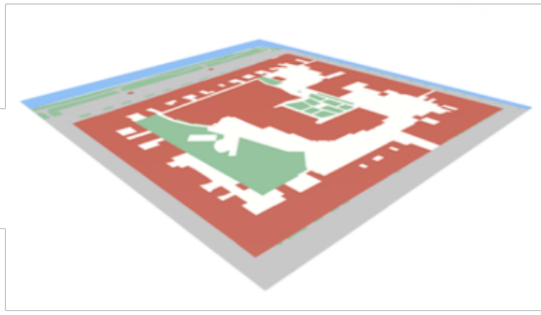
Time series of water
levels in CZML format
using python converter

1. Generation of 3D model using 3dfier

our open-source software

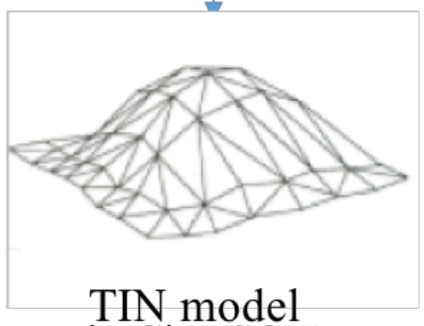


AHN3 Point cloud



2D BGT

3dfier



TIN model in CityJSON

3D Building model in CityJSON

+ Simulation parameters

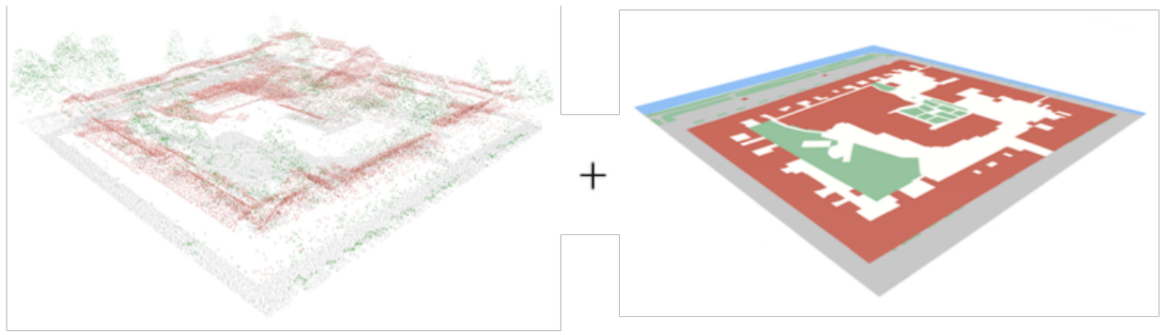
ANUGA

CityJSON to glTF python converter

Time series of water levels in CZML format using python converter

CESIUM

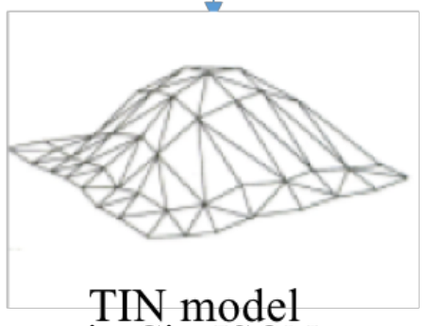
2. CityJSON to glTF conversion for Cesium visualization



AHN3 Point cloud

2D BGT

3dfier



TIN model
in CityJSON

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ANUGA

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CESIUM

CityJSON2glTF

- Main challenges:
    - CityJSON supports ISO 19107 geometry types such as polygons, solids, composite solids, etc. whereas glTF geometry is **purely triangles**.
    - CityJSON geometry is in JSON format whereas glTF geometry is stored as a binary file (*.bin).
    - CityJSON has support for semantics of city objects while glTF lacks semantics.

CityJSON2glTF

https://github.com/tudelft3d/CityJSON2glTF

tudelft3d / CityJSON2glTF

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An experimental python utility to convert CityJSON datasets to glTF 2.0 and schematically validate glTF datasets

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kkimmy update readme — Latest commit 48ee8c4 5 hours ago

sampleData	cwd fixed	5 hours ago
.gitignore	Initial commit	9 days ago
LICENSE	Initial commit	9 days ago
README.md	update readme	5 hours ago
cityjson2gltf.py	cwd fixed	5 hours ago
glTF_schema_validator.py	glTF validator	9 days ago

README.md

CityJSON2glTF

An experimental python utility to convert CityJSON datasets to glTF and schematically validate glTF datasets.

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glTF Viewer

https://gltf-viewer.donmccurdy.com

delft.json

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Adding Building Geometries

localhost:8080/SampleScripts/delft.html

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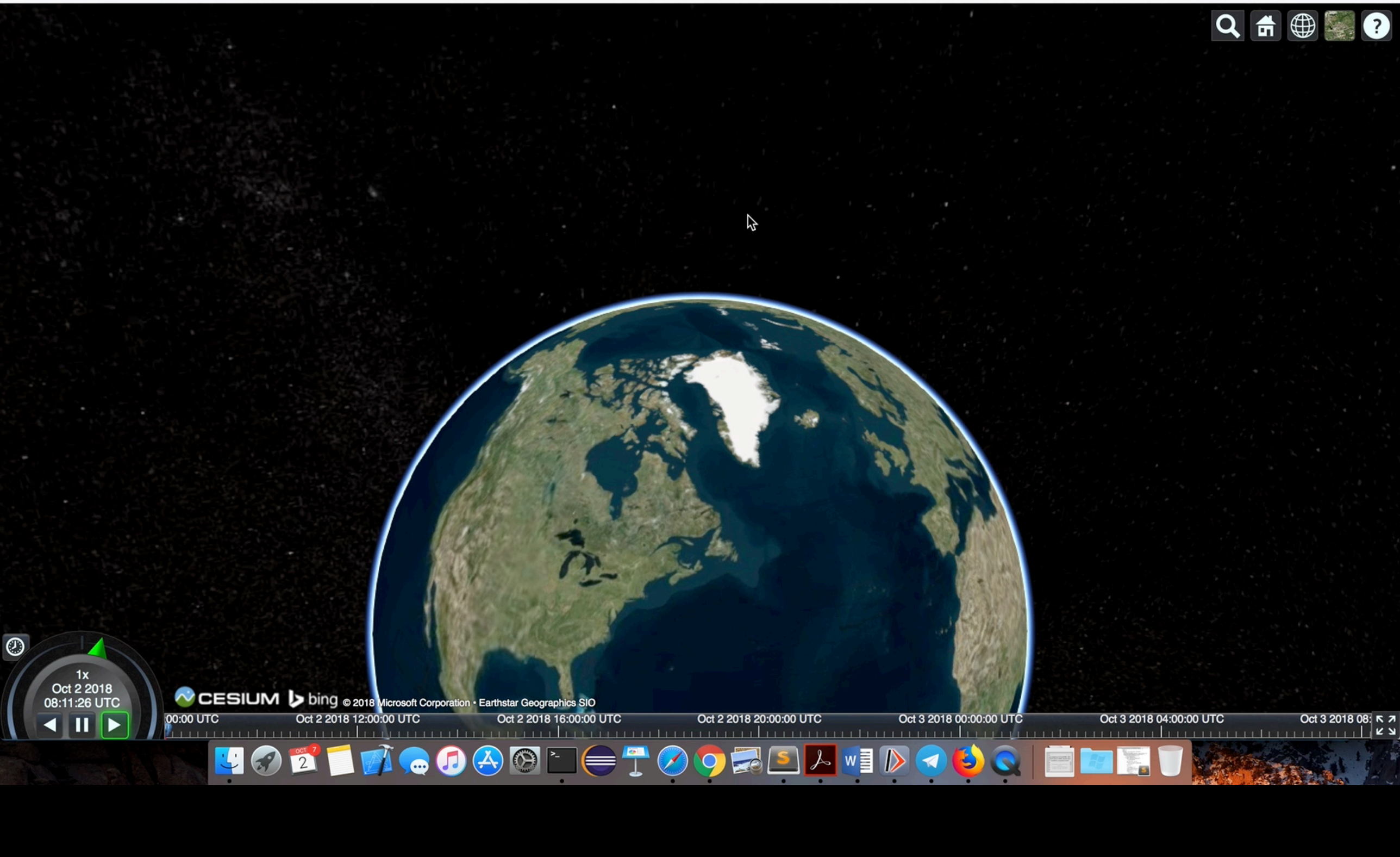
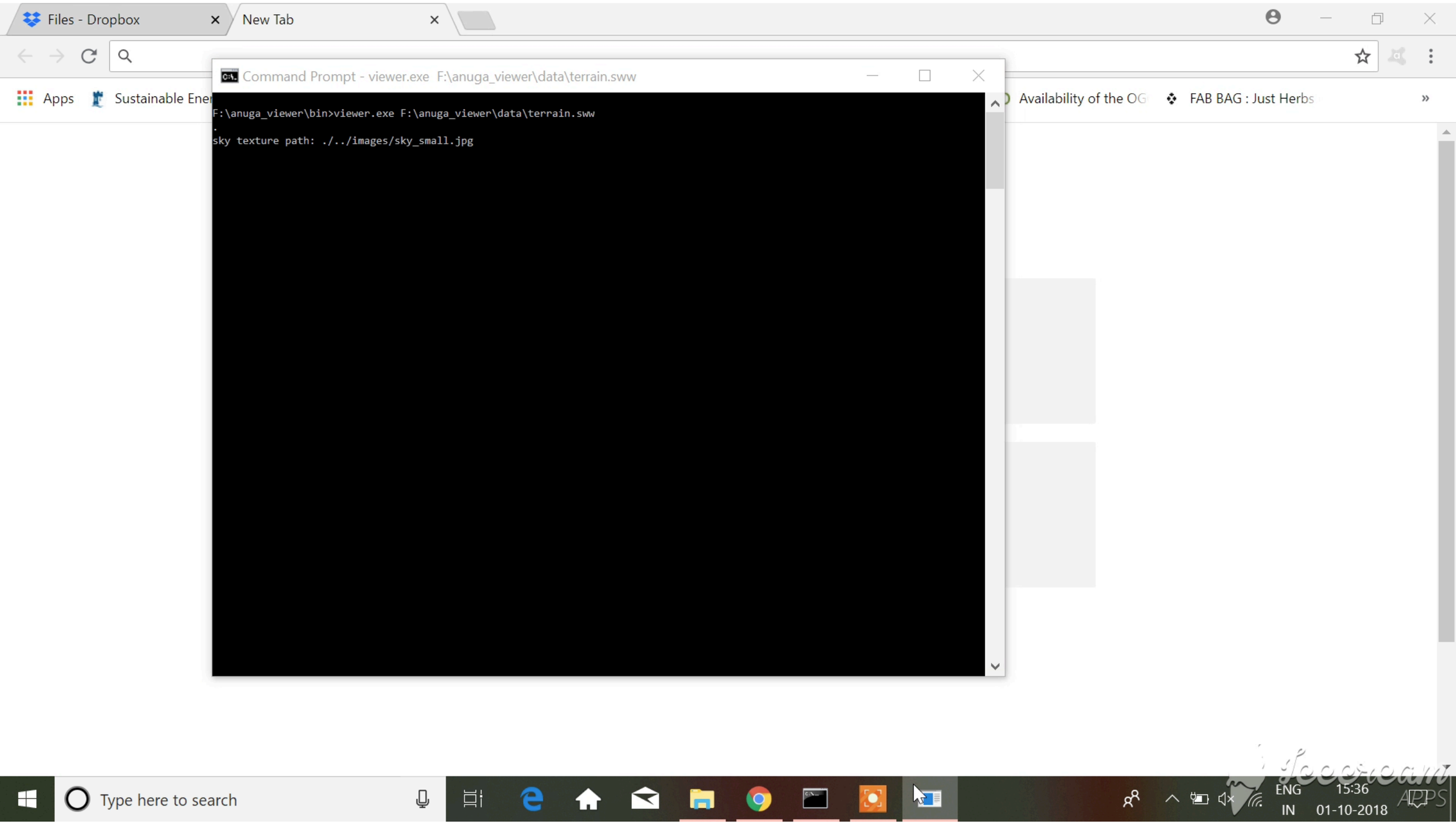


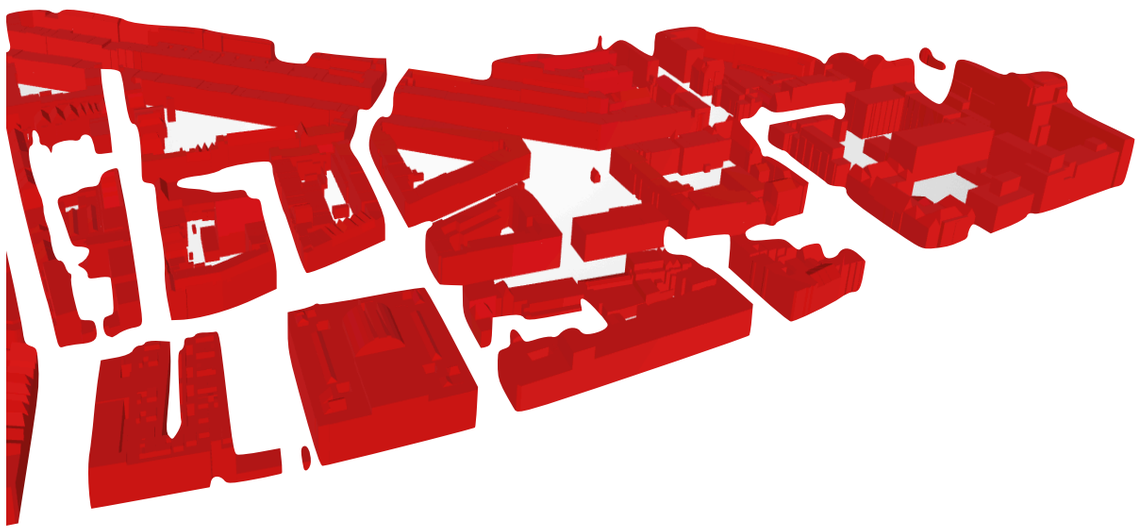
3. Generation of time series of water levels

- Software: Free & Open Source Hydrodynamic Model *Anuga*
- Inputs:
    1. TIN Terrain model (CityJSON format)
    2. Simulation parameters (Initial stage, friction, porosity, conductivity) (data provided by Nelen & Schuurmans)
- Implementation: Python interface for Anuga to read and process CityJSON TIN terrain model

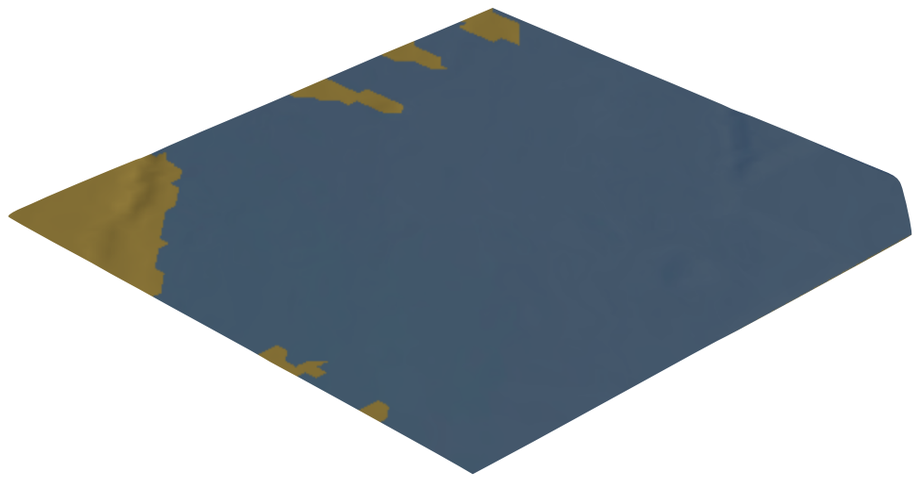
Visualization in Anuga viewer



4. Visualizing water levels using CZML (ongoing work)



Building model in glTF format



Time series of water levels generated by Anuga

Direct rendering

Convert to CZML

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Thanks!

all open-source software at www.github.com/tudelft3d