GWS1:
GWS + Theory Interest Group

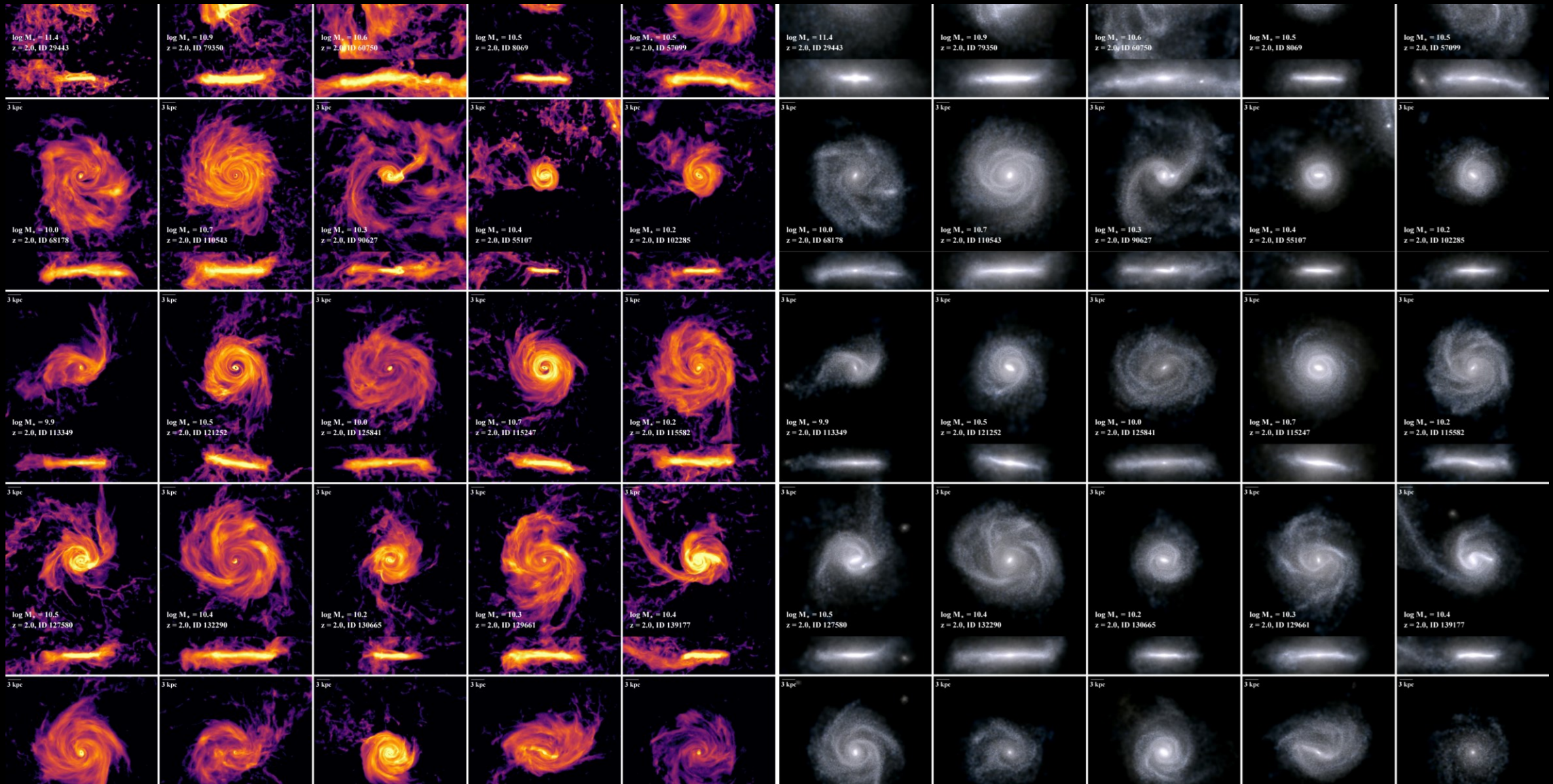Cosmological simulations on science platforms

Wed Nov 18, 20:30 UTC

This session

- Some background
  - Theory in the VO and the IVOA
  - Why science platforms ?
- Talks:
  - Bridget Falck:
    - *The Indra Simulations on the SciServer Science Platform*
  - Simon O'Toole
    - *The Australian Astronomical Theory Hub: building a simulation and model archive*
  - Stefano Russo
    - *Rosetta HPC Science Platform*
- Discussion

Theory needs special attention ([pdf](#))

- No common sky
  - what to query for?
- No common objects between simulations (in general)
  - what to compare, cross-match?
- Heterogeneity of data products
  - not just photons at time T from direction V with energy E and polarization P
- No existing standardization in simulations community
  - E.g. no FITS for simulations

Illustris-TNG Simulations, https://www.tng-project.org

Theory Interest Group (since 2004)

- Represent theorists to IVOA

- Represent IVOA to theorists

- 2 standards:
  - Simulation Data Model (SimDM):
    - https://ivoa.net/documents/SimDM/20120503/index.html
    - Model for a registry of simulation products
  - Simulation Data Access Layer (SimDAL)
    - https://ivoa.net/documents/SimDAL/20170320/index.html
    - Discovery and retrieval of simulation products

- I think fair to say not much take up

Why interest in science platforms?

First, what is a science platform?

- https://www.stsci.edu/contents/newsletters/2018-volume-35-issue-01/science-platformsserver-side-analytics
- https://baas.aas.org/pub/2020n7i146/release/1

Why?

- Lack of take up of standards
- Cosmological Simulations, big and complex:
  - Need to bring advanced, custom analysis to the data
  - Support collaboration to share expertise as well as data
- Specialized, optimized services can be deployed and shared next too the data
  - I/O libraries for non-standard file formats
  - Massive statistics (e.g. P(k), Bridget's talk)
  - Synthetic telescopes ---->---->---->---->---->---->---->---->
  - …

Some examples

- Millennium Database:
  - http://gavo.mpa-garching.mpg.de/MyMillennium
  - brings SQL filtering and aggregation to the object catalogues
- SciServer: (www.sciserver.org)
  - www.sciserver.org
  - Database and raw data files (from DB and container mounted)
  - Jupyter services in docker containers close to the data
  - Collaboration features support sharing of data, scripts and **expertise**
- Illustris(-TNG):
  - https://www.tng-project.org/data/lab/
- Theoretical Astrophysical Observatory (TAO)
  - https://tao.asvo.org.au/tao/
- CosmoSim
  - https://www.cosmosim.org
- …
- …

Talks

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Discussion

- Use cases for publishing simulations on science platforms?
  - link to observational surveys
- Interoperability?
  - At least some (re)use
- Maybe: Standard framework for publishing (python) libraries for accessing specific simulations (ala astroquery)
  - E.g. yt (https://yt-project.org)
- With GWS: 0.5 day workshop in ~Feb to make some plans