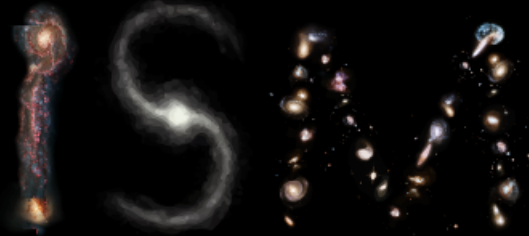2021
ISM
OF GALAXIES

Round table 2

MODELS TO INTERPRET ISM OBSERVATIONS

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Only remote sensing → Absence of Observational Ground Truth

- How do we know that we achieve the truth?

- Which observations can discriminate physical and chemical processes?

- Can we consider some unknown physical/chemical parameters as just an additional source of noise?

- What is the role of imperfect data reduction? Should we go to models taking into account imperfections of the observations?

Observations vs. Models

- The geometry problem
  - → How to tackle mixing of different environments along a pencil beam line of sight? Mixture of dust properties, dense vs diffuse environment, …
  - → How to tackle mixing of many environments in a single kpc beam of high-z galaxies?

- How to compare models and observations?
  - → Is the statistical analysis of observations the only way forward? What about observation benchmarks for ISM?
  - → Possibility to lift the degeneracies coming from integration along the line of sight.

- Possibility to turn on/off some part of the physics/chemistry to understand its impact?

Which model complexity for which observations?

- How do we know the right model complexity for a given set of observations?

- How to disentangle the degeneracy between physical parameters?

- Do more observations bring more constraints or just more complexity?

- Will the modeling of foregrounds be required for current and future cosmological experiments (CONCERTO, EUCLID, LITEBIRD, …)?
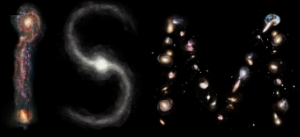
On the need of laboratory astrophysics

- Do we need laboratory astrophysics to understand ISM, IGM?

- Is laboratory astrophysics any useful to high-z study?

Modeling vs Simulations

- High complexity vs simplified simulations
    - → Currently impossible to put all physics and chemistry in a simulation of a GMC or a galaxy
    - → Is subgrid physics and chemistry the solution?
    - → Do we miss macroscopic phenomena with subgrid physics?

- Semi-analytical vs numerical challenges

- 1D vs 3D: Which effects do require full 3D simulations?

- Stationary vs out-of-equilibrium: Which effects can be treated as stationary?

Towards a UNIX-like model of ISM?

- Extremely precise models of dust, shocks, PDRs, HII regions
    - → In extragalactic observations, we always get a mixture of all of these:
      Is it possible to imagine interoperability of detailed models to get a better
      description of reality?