Leibniz-Institut für
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Teacher workshop on data from cosmological simulations

IVOA InterOp, Cape Town, 12th May 2016

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Event

- “100 Jahre Allgemeine Relativitätstheorie” by Wilhelm und Else Heraeus Lehrerfortbildung
- 100 years of General Relativity, seminar for (high) school teachers, March 2015
- organized by AIP, https://meetings.aip.de/art100/
- ~ 80 teachers from all over Germany
- 4 days of talks
- 3 workshops, including:
  - Hands-on session: How to access cosmological data

Goals of hands-on session

- show that data from state-of-the-art simulations is publicly available
- interaction of VO tools (Topcat, SAMP)
- data can be used freely for any purpose, also for high school projects

Organization

- computer pool with 26 computers (23 working) with Windows XP
- whiteboard with urls to Topcat, tutorial-pdf, webpage

- planned: 2 groups with 20 people, each 30 min
- what happened: 1 group with ~ 40 people, 60 min
- => needed extra chairs, very crowded

Program

- Talk: Introduction to cosmology and simulations (15 min)
  - very general, done by my colleague Arman Khalatyan
- Hands-on session (45 min):
  - print-outs at each desk
  - showing live with beamer and notebook how to query the database
  - Topcat for visualisation
- Questions (informal, afterwards)

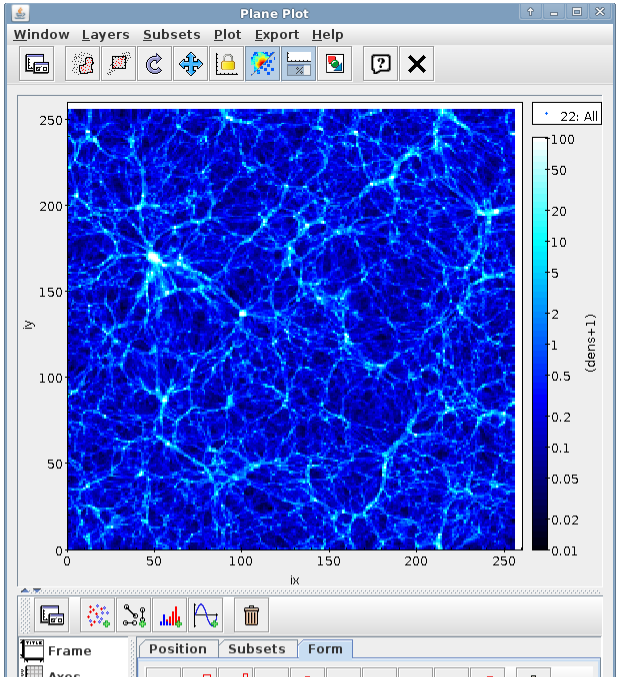
Tool

- CosmoSim database (www.cosmosim.org):
  - different data from simulations of the universe:
    - dark matter halo catalogs
    - snapshots with raw data (particles)
    - density fields
  - access via web interface or UWS interface
  - directly enter SQL queries
  - connection to Topcat via SAMP (or download)

- User account
  - usually users need to register
  - prepared 26 workshop accounts (one for each computer)
  - used a script (uws) to run all the queries from the tutorial for each account
  - prepared result files (votables) on the web
  - => in case of server failure, people could at least follow steps with Topcat

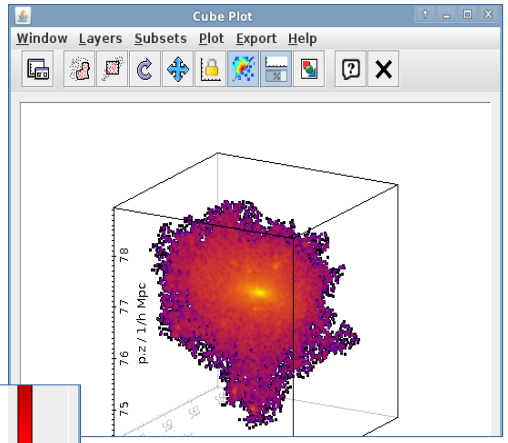
Hands-on tutorial – Tasks I

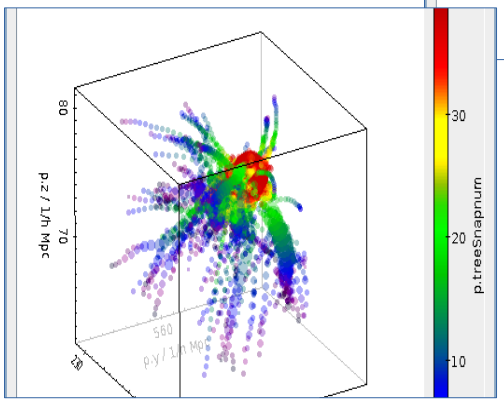
- available at edu-repository:
  - http://svn.ari.uni-heidelberg.de/svn/edu/trunk/gavo_simulations_teachers/
- 1) Denstiy field:
  - run a query to get a slice of the density field
  - send results to Topcat (SAMP)
    - was not working with some browsers
      => store results and load manually
  - view the density in Topcat
    - adjust aux shading, log. scale, color table
  - load more densities from different timesteps
    - load multiple datasets in Topcat
    - adjust range
    - to follow evolution of the density field, i.e. (merging of matter to big clumps)



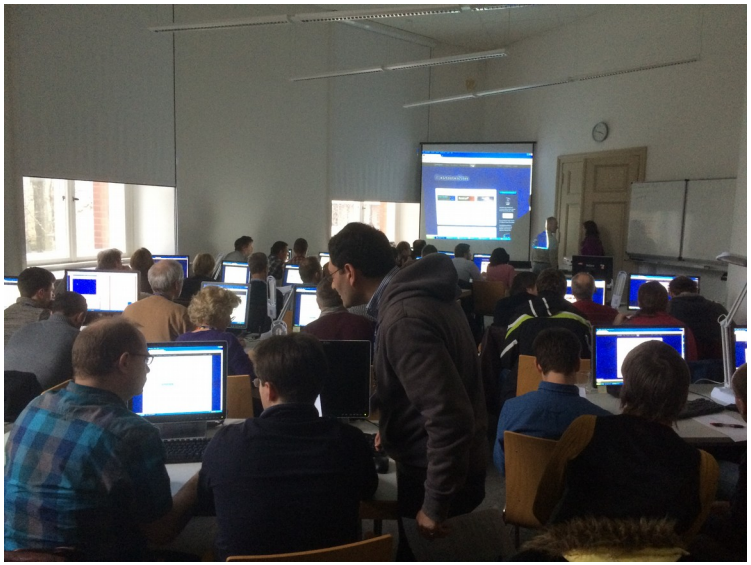
Hands-on tutorial – Tasks II

- 2) Dark matter halos
  - query for halos for the same slice, overlap with density field
  - query for 3D distribution of halos
    - Cube Plot in Topcat, shading-type: density
  - query for particle distribution of a halo
  - mass growth of a halo
  - progenitors of a halo (merger tree)
    - use Aux-axis for coloring





Lessons learnt I



- Always print the title page
  - do NOT print only pages 2-7 to save paper
  - title page contains a short intro
  - people were not listening, just following the hand-out and missed the context what it all was about
- Have two people per computer
  - one reading instructions, the other typing
  - computer pool had only one seat per computer, not enough space
- Pre-install Topcat on each machine, already open pdf and web browser with web interface
  - due to other technical difficulties (network, some computers not awakening at all) there was not enough time to do this on all
  - people got confused: What is the pdf for? What is Topcat? Where again do I need to enter what?

Lessons learnt II

- Restrict to 10 or 20 people
  - 40 people with 2 “experts” does not work in this limited time
  - too noisy, people in the back could not hear what I said
- Separate parts with “show+listen” and “work+help”
  - tried to do it all in parallel → not a good idea, people work with different speed, get stuck at different points, too noisy, only a few people paying attention
  - better: show first steps, let them do something on their own, walk through results afterwards
- Concentrate on a few tasks and give more explanations
  - time too short to fit everything in
  - most knew nothing of cosmology or dark matter
    - more explanations would have been needed
    - need more to the point introduction

Result

- Some (most?) teachers did know nothing about the topic beforehand and did not take much away from this

  (cosmology talks were only scheduled two days later)
- Some were very interested, followed tutorial on their own,
  asking for how to use this, how to get accounts for own school
- But: I heard nothing back from them, no further queries with the workshop accounts, no one asking for more accounts

- Conclusion:
  - It's worth trying, but
    - this topic needs more thorough introduction (some full talks beforehand, maybe also database intro, why publish data, what is VO)
    - concentrate on fewer tasks
    - don't expect too much from teachers
      (previous knowledge on the topic, computer experience, listening skills)