

CLUMPY hands-on session @ ISAPP21

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What is CLUMPY?

CLUMPY is a code for the calculation of gamma-ray or neutrino signals from annihilating and decaying astrophysical Dark Matter. It has various modules, which allow to calculate the so-called J-factor from various targets and the corresponding fluxes, to account for the boost from halo substructure, and cosmological effects as well as gamma-ray absorption for extragalactic targets. It also includes a module for the Jeans-analysis to reconstruct the DM density from kinematic data.

What will you learn in this session?

In this hands-on session, you will learn the various functionalities of CLUMPY to calculate the J-factors from different targets, and accounting for their substructure, and understanding and analyzing the code's output. We will also explain the principal approach of the code to confront the DM-density integration problem, and the assumptions being made. We will give several tasks to be solved (in small groups) during the session.

How to prepare for the hands-on session?

- Please download and install the code from <https://gitlab.com/clumpy/CLUMPY> before the tutorial. Detailed instructions, help, and troubleshooting for the installation can be found at the code's website: <http://clumpy.gitlab.io/CLUMPY/install.html>
- Compiling CLUMPY with a present installation of ROOT (<https://root.cern.ch/>) is recommended, as it allows the display of CLUMPY's direct pop-up graphics.

If you face any installation problems, please write to Moritz Hütten (mhuetten@mpp.mpg.de)

- Have Jupyter notebook (<https://jupyter.org/install>), with healpy (<https://healpy.readthedocs.io>) installed.
- Optional: <https://heasarc.gsfc.nasa.gov/ftools/fv> or ds9 or Aladin Skyviewer.

On the CLUMPY website, <http://clumpy.gitlab.io/CLUMPY>, there is ample information about the code, examples, and background information, including the three code papers so far by Charbonnier et al. (2012), Bonnivard et al. (2016) and Hütten et al. (2018). You do not need to read through all of this for preparation, as many of the content will be presented in condensed form during the tutorial, but feel free to skim through it to get a glimpse of what CLUMPY is about.