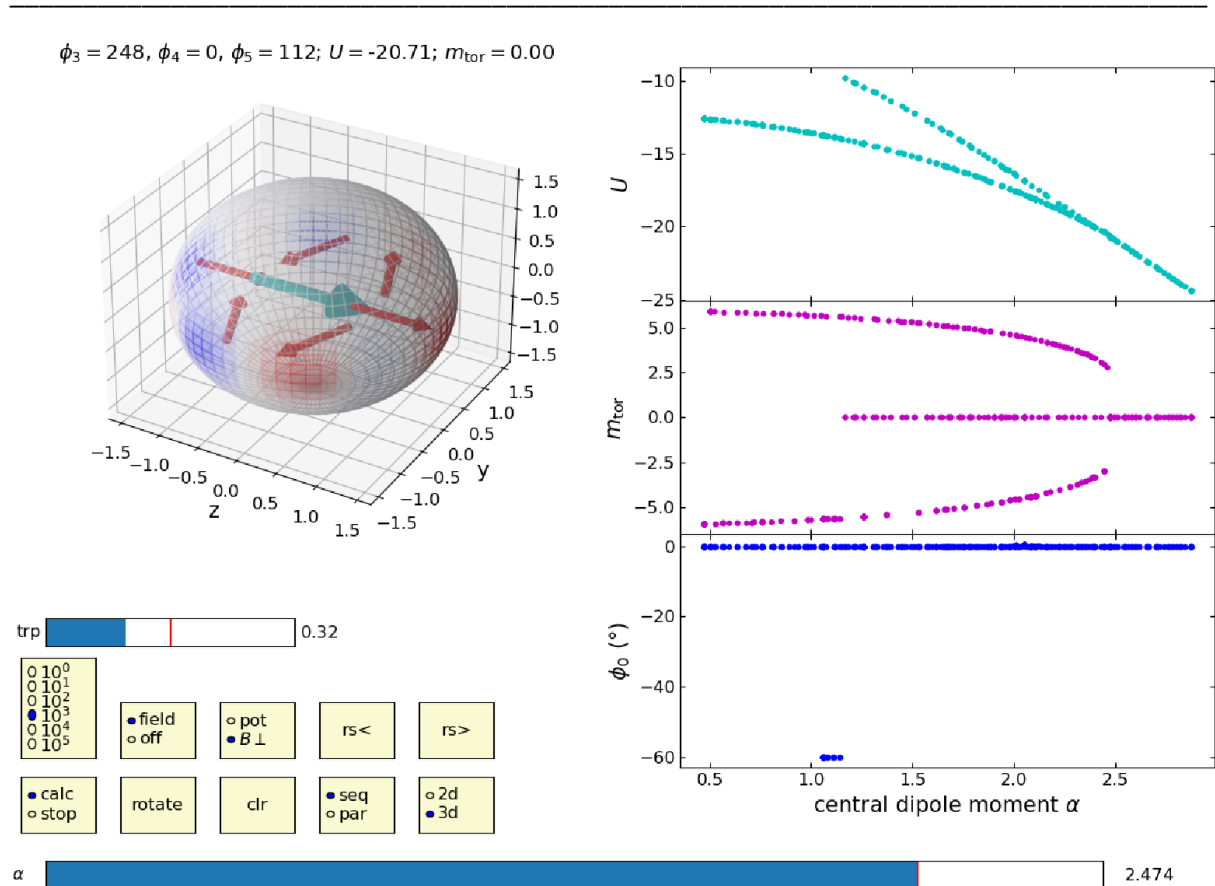


“animate_dipole_cluster.py”: Python code for the animation of hysteretic transitions of a magnetic dipole cluster.

Available at: <https://zenodo.org/record/6380540>

See some details of the physics are described in

<https://doi.org/10.48550/arXiv.2203.13670> and the references cited therein.



The 3d-figure on the left hand side shows the seven dipoles in the filled hexagon configuration. Its orientation can be manipulated with the mouse. The title shows 3 of the dipole angles (the other ones can be determined from those due to the symmetry of the ground state), the magnetic potential energy U , and the toroidal moment m_{tor} of the present state.

The figures on the right hand side show

- the potential energy of the dipole-dipole interaction,
- the toroidal magnetic moment,
- and the angle of the centre dipole with the x-axis.

α - slider: Manipulates the strength of the centre dipole, the bifurcation parameter.

calc/stop radio button: stop and restart the calculation.

rotate button: Turns all dipoles in such a way that the angle ϕ_0 of the centre dipole is within $\pm 30^\circ$ (This is always possible because of the 6-fold symmetry of this problem).

clr button: erases the memory of the stored values of ϕ_0 , m_{tor} and U .

seq/par radio button: switch between parallel and sequential update within the relaxation algorithm.

2d/3d radio button: Switches between 3d and a 2d (explained below) display of the configuration.

$10^0 \dots 10^5$ radio button: the number of iteration between an update of the figure.

field/off radio button: Show additional fields or turn them off.

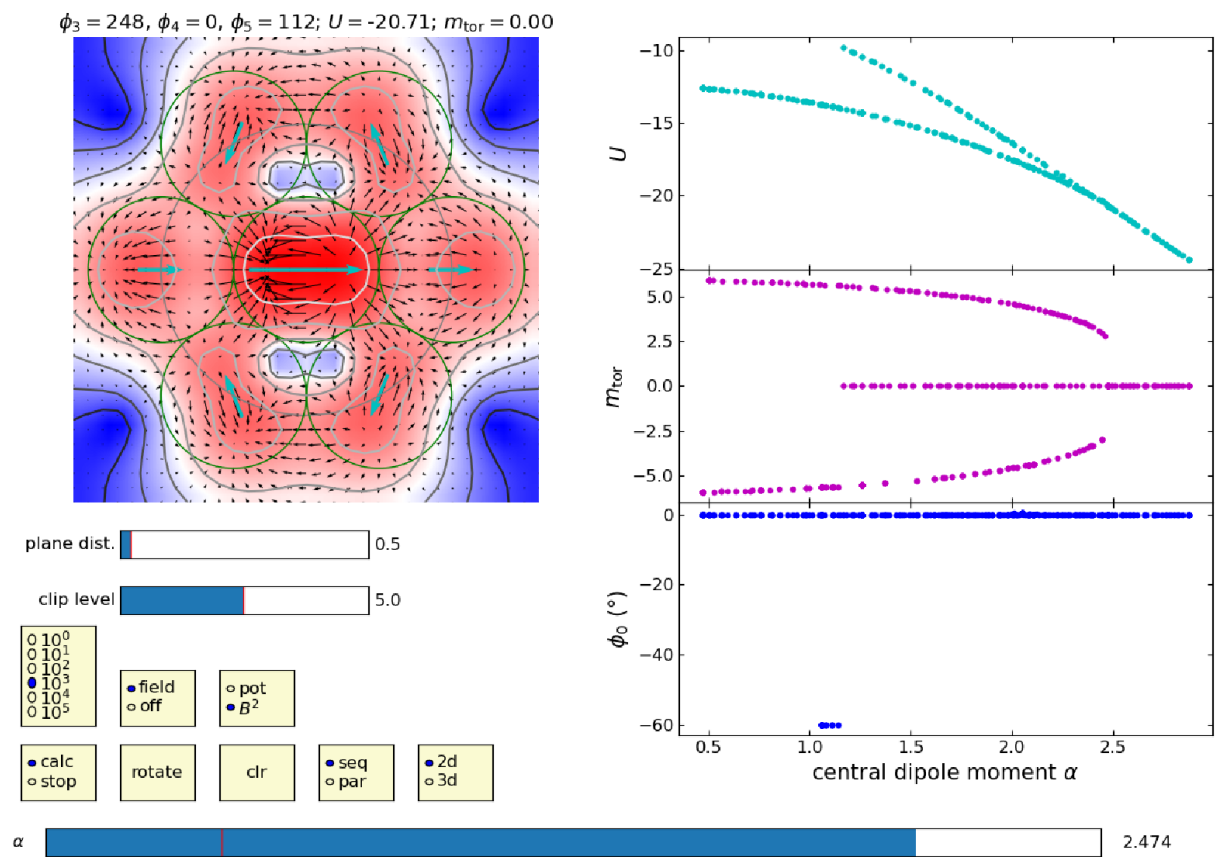
pot/ B_{\perp} radio button: The field can be the potential,
- or the component of the B field perpendicular to the surrounding sphere.

rs< button: decreases the resolution of the “sphere”.

rs> button: increases the resolution of the “sphere”.

trp-slider: sets the transparency level of the sphere.

For the 2d-representation with an active background two additional sliders are available:



pot/ B^2 radio button:

- Switches between the potential
- and the field energy density

which is shown on a plane above the planar hexagonal configuration.

plane dist. - slider: determines the distance of the plane from the planar hexagonal configuration.

clip level - slider: Can be used to manipulate the colour distribution of the background.
- The number denotes a multiple of the standard deviation of the scalar field.