2D Conditional averaging

Given 2D imaging data, select a reference pixel on which:

- Find all events where the signal is over a **threshold**.
- For each event:
  - Define the **peak** as the event maximum
  - Register and save the data centered in the peak with a fixed **window size**
  - Optionally, discard the event if any neighbour pixels at a distance lower than check argument have a higher value at the time the peak occurs.
  - Optionally, discard events with overlapping windows with preference for higher amplitude events.
- Return list of events and average over all events

Arguments

| Name	Description
`dataset`	The 2D imaging data to process
`reference pixel`	Pixel to base events on
`threshold`	Minimum signal value for events
`window_size`	Size of data window around peaks
`check_max`	Distance to check neighboring peaks
`single_counting`	Avoid overlapping event windows

Synthetic data

Simulated 5x5 data with 1000 blobs:

`lx/ly = 1/3` , `theta = -π/4` , `v = 1` , `w = -1`
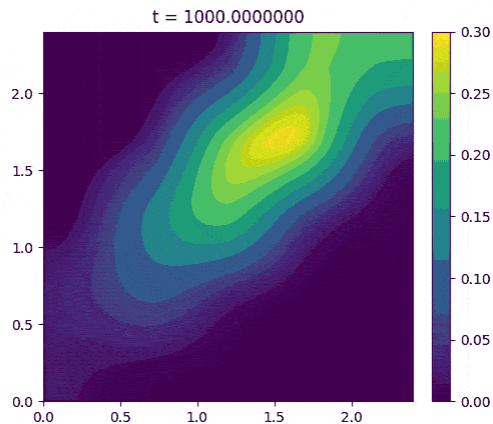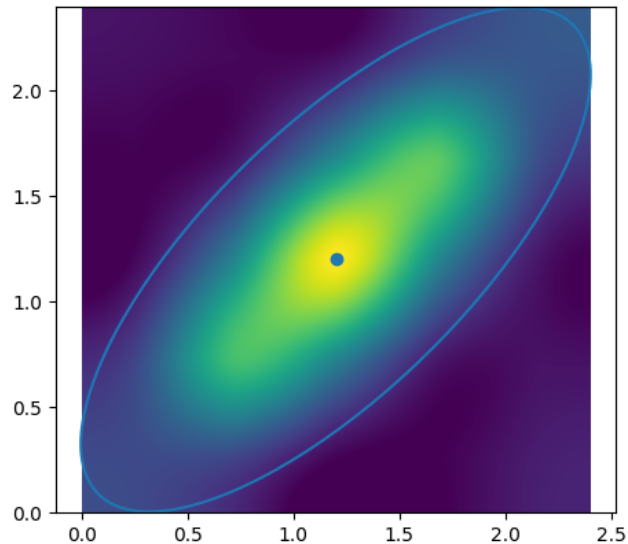
Result

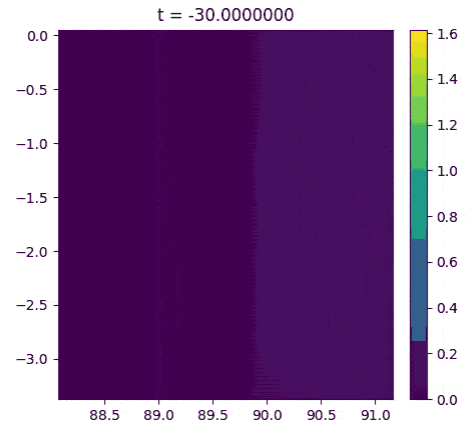Averaged output after conditional averaging:
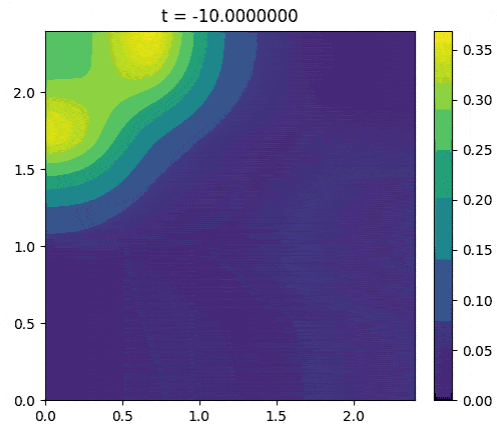
Parameter estimation

Fit to a rotated ellipse to estimate sizes ℓ_x and ℓ_y and rotation θ

$\ell_x = 1.57, \ell_y = 0.62, \theta = 0.78$

Results: I mode

Results: L mode