Open Clusters Membership by Clusterix 2.0 for Gaia DR2   http://clusterix.cab.inta-csic.es
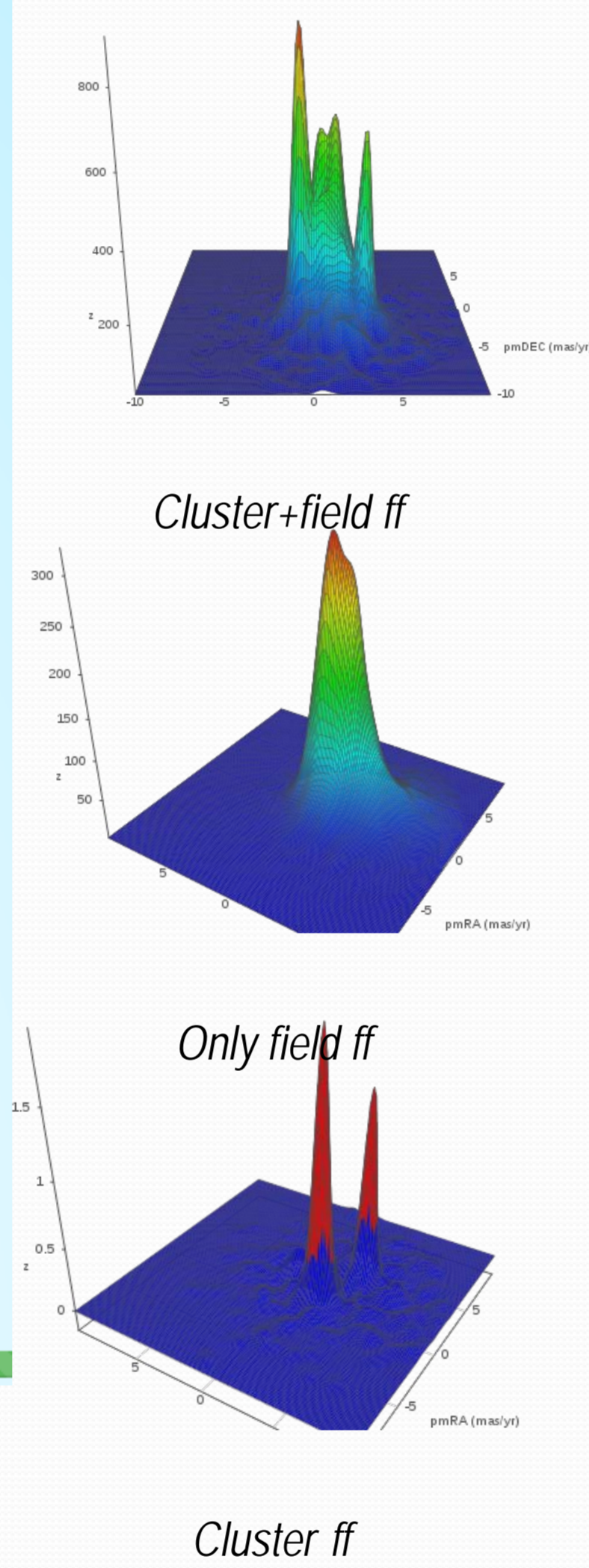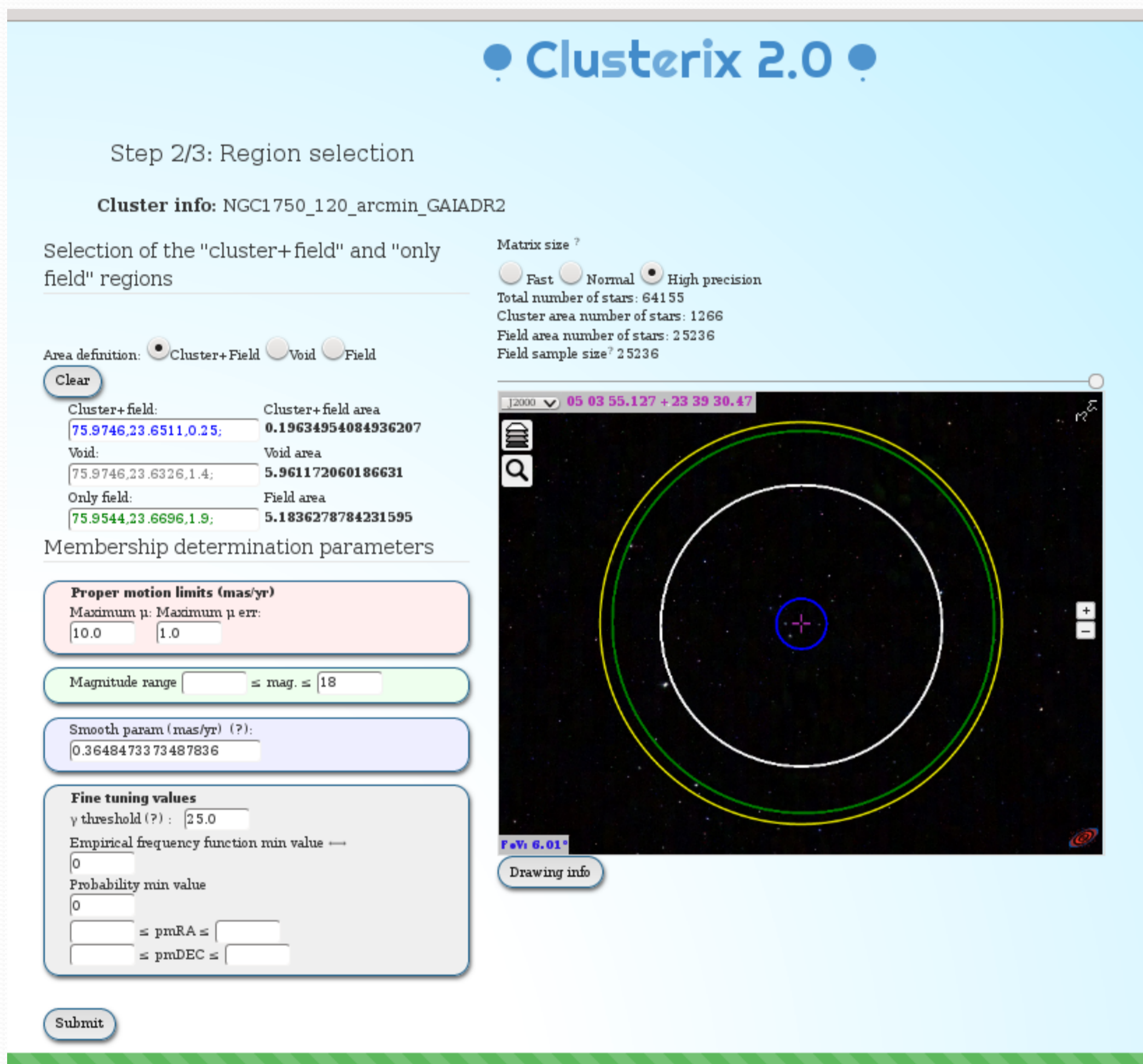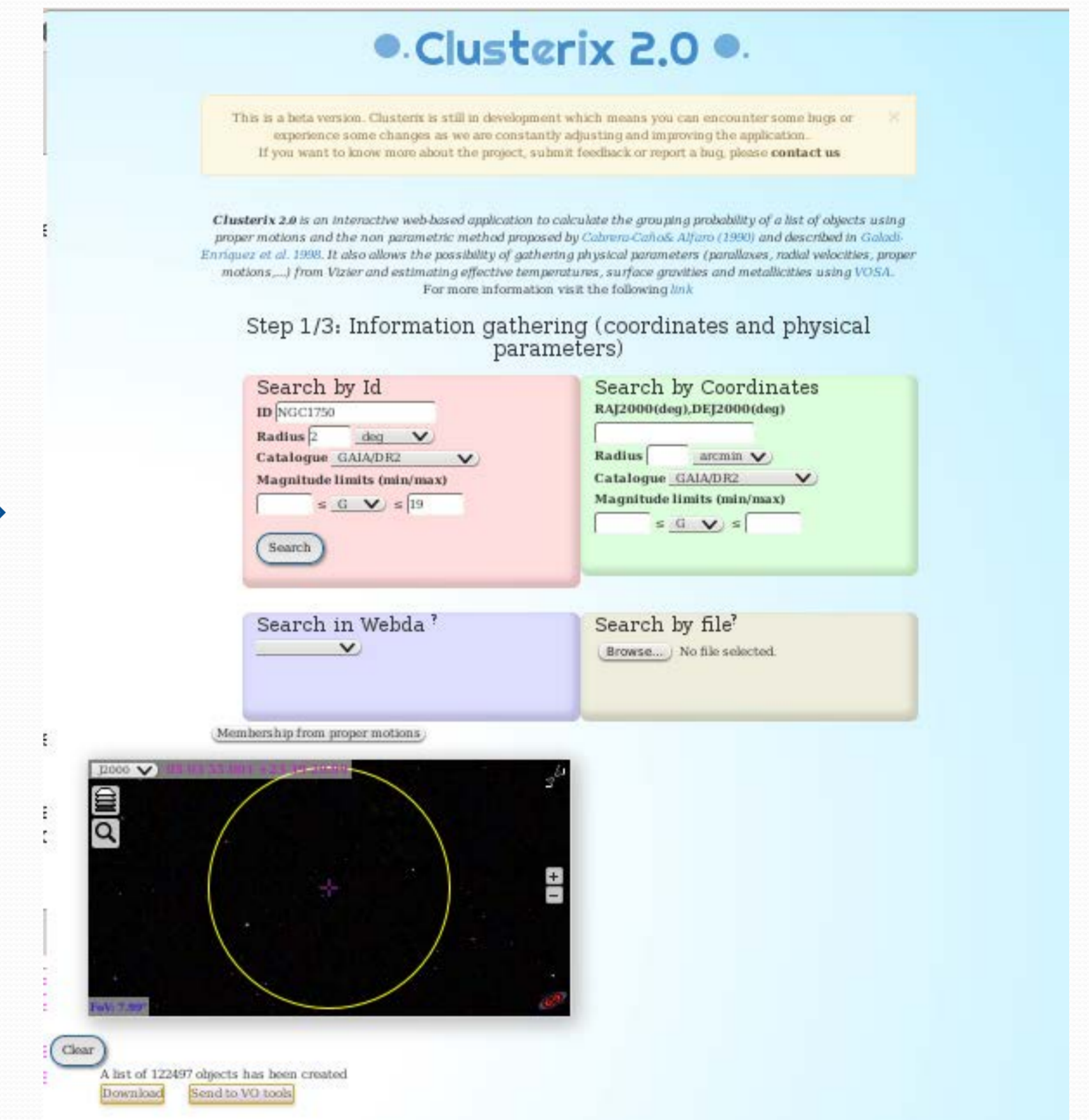
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We present an advanced version of Clusterix, a tool for the determination of membership probabilities in stellar clusters from proper motion data adapted to the new wealth of Gaia data. Clusterix is a VO web-based, interactive application that allows the computation of membership probabilities from proper motions through a fully non-parametric method (Galadí-Enríquez et al. 1998). Clusterix 2.0 has been adapted to the exploitation of Gaia Data Release 2 and now features an improved user interface for a faster, easier and more accurate interactive definition of the cluster and field proper motion distributions. The system provides fast feedback between membership probability determinations and the distribution of the observables for the most probable members and field stars. We present the first results of Clusterix for the case of one area where two clusters (NGC 1750 & NGC1758) are found without a priory knowledge.

Step 1/3: Data acquisition

➢ Clusterix offers the following search possibilities:
  - Search in catalogues by giving a position in the sky (object name or coordinates) and a radius. ("Search by ID" and "Search by Coordinates")
  - Use clusters available in the Webda service (http://webda.physics.muni.cz). ("Search in Webda")
  - Use private data as input file. ("Search by file")
➢ Once the query has finished, Clusterix provides information on the number of objects found and allows the user to save the result of the query as a CSV file ("Download") or send it to any VO-tool (e.g. TOPCAT) using the SAMP protocol.
➢ Aladin-lite (http:// aladin.u-strasbg.fr/AladinLite/) is used to visualize an image of the field of view with the selected sources on top of it.
➢ Finally, if the selected catalogue / user's input file include information on proper motions, a new button ("Membership from proper motions") offers the possibility of moving to the next step in the Clusterix workflow.

Step 2/3: Selection of the *"cluster+field"* and *"only field"* regions

➢ In this step the user defines the *"cluster+field"* and *"only field"* regions. If necessary the user can also define a buffer region "void" that surrounds the cluster area but is not yet clean enough to be representative of the field.
➢ Cluster / field segregation is performed by Clusterix using the non-parametric approach described in Galadí-Enríquez et al. (1998) under two basic assumptions:
  - The region selected as *"only field"* has a negligible cluster contribution.
  - The *"only field"* region gives a reliable representation of the field frequency function in the region of the sky occupied by the cluster.
➢ Gaussian kernel functions are used with Gaussian dispersions given by the smooth parameter *(h)*. Also, the threshold (γ) is set to avoid meaningless probabilities in zones of low density due to imperfect representations of the *"only field"* region. Both parameters can be interactively tuned by the user. The user has also the possibility of selecting members of the cluster limiting the maximum in proper motion and/or in error.
➢ To fine-tune the selections, Clusterix also provides a visualization of the probability density functions

Cluster+field ff

Only field ff

Cluster ff

Step 3/3: Determination of membership probabilities

➢ In this step Clusterix returns a table with the membership probabilities of the list of objects gathered in the first step and fulfilling the requirements defined in the second step. The table can be downloaded as a text file or send via SAMP to other VO tools for its further analysis and to VOSA for the calculation of physical parameters.

NGC 1750 & NGC1758

➢ In an area of 2º around NGC 1750 (119 749 stars) Clusterix finds two clusters with 2977 members in total. With the results from Clusterix we plot the proper motion diagram and we can clearly separate the two populations: NGC 1750 with 1774 members and NGC1758 with 1203 (see figures below), up to G= 19 mag. By simply introducing a further selection based on parallaxes, one can easily clean the colour-magnitude diagrams. The average proper motion of the clusters is:
  - $\mu_\alpha \cos \delta = -0.99\pm0.22$; $\mu_\delta = -2.40\pm0.19$; $\varpi = 1.37\pm0.08$ for NGC1750 and
  - $\mu_\alpha \cos \delta = 3.17\pm0.22$; $\mu_\delta = -3.48\pm0.18$; $\varpi = 1.10\pm0.09$ for NGC1758
➢ In Galadí-Enríquez et al (A&A 337, 125, 1998) they found 79 members for NGC1750 and 57 members for NGC1758, up to R = 15 mag.

$1.21 < \varpi < 1.61$

NGC 1750

$0.90 < \varpi < 1.32$

NGC 1758

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