The merger of galaxy clusters consists of an excellent astrophysical laboratory for the study of their three main components: dark matter (DM), intra-cluster medium gas (ICM) and galaxies. The main feature for the investigation about the self-interacting behaviour of the DM comes from the observed detachment between the cluster DM halo and the ICM distribution observed soon after the pericentric passage. A question is: what are the conditions for the occurrence of such detachment? We will present some insights regarding this topic based on a combined mass reconstruction plus hydrodynamical simulation of the merging galaxy clusters Abell 1758 ($z = 0.027$) and Abell 3376 ($z = 0.046$), both consisting on double systems (main cluster and subcluster). Whereas in A1758 the main and most massive cluster has retained its gas content (i.e. no detachment is observed), in A3376 this happened in the less massive substructure, showing that the mass alone cannot explain the detachment observed in dissipative systems. On the other side, our simulations suggest that the gas concentration take an important role on that. We also brings new insights about the merging cluster A2034 ($z = 0.114$), a system which shows a double detachment between the DM and the ICM distribution. Moreover, in all previous systems, the DM and the galaxy distributions (traced by the correspondent BCG) are comparable showing a spatial agreement.

**ABELL 1758**

$z = 0.027$

This cluster is composed of two main structures called A1758S and A1758N. Conversely, the northern structure (this work) is composed of A1758SW and A1758NE which show a remarkable feature: while in A1758NW, there is a spatial agreement among weak-lensing mass distribution, ICM and its brightest cluster galaxy (BCG). In A1758SW, the X-ray peak is located 96 arcsec away from the mass and BCG positions. Combining our radial velocity data with hydrodynamical simulations, we have shown that A1758NW and NE had their closest approach 0.27 Gyr ago and their merger axis is located 21 degrees from the plane of the sky.

**ABELL 2034**

$z = 0.114$

The merging galaxy cluster A2034 is comprised (at least) by a major (A2034S) and a subcluster (A2034N). Our dynamical analysis points that the pericentric passage has happened 0.56 Gyr ago and it has lead to a gas-detachment in both substructures. Our results also show that the movement is taken place in a plane just 27 degrees in relation to the plane of the sky is the system is currently going to the apogee.

**ABELL 3376**

$z = 0.046$

The galaxy cluster A3376 is a nearby dissipative merging system surrounded by two prominent radio relics and showing an X-ray comet-like morphology. The merger system is comprised of the subclusters A3376W and A3376E whose merger axis is very close to the plane of the sky (just 10 degrees). The cometary-shaped X-ray distribution shows only one peak spatially coincident with both eastern BCG and A3376W mass peaks whereas the gas content of A3376W seems to be stripped out. From our dynamical analysis, the merging cluster is seen 0.9 Gyr after the pericentric passage and it is currently going to the point of maximum separation from the subclusters.

**Take Home Messages**

- Our results show that, within the uncertainties of the weak lensing technique and the applied methodology, the position of the peaks of the DM distribution and the galaxies (traced by the local BCG) are spatially coincident.
- The agreement between the DM and galaxy peaks can induce some noise in the models which aim to constant a possible self-interaction behavior of the dark matter based on the measurement of the detachment galaxies/DM (e.g Harvey D. et al., 2015, ApJ, 806, 20).
- We observe a detachment between the DM and the ICM in a variety of colliding systems. However, it is not completely clear what the features which lead to the detachment between the gas and their correspondent DM halo since they remain trapped in some systems.
- Our hydrodynamical simulations suggest that the concentration of the DM can place an important role in the occurrence of those detachments. However other effects can be acting simultaneously (e.g. impact parameter, the relative velocity of the subclusters).