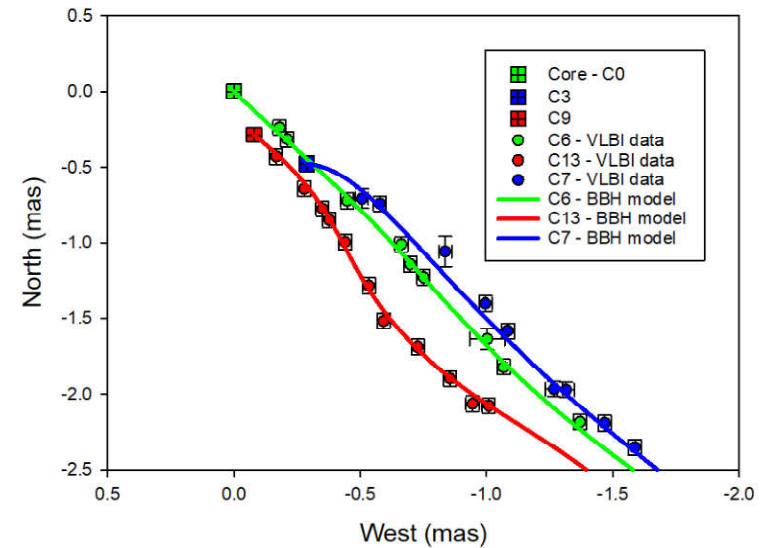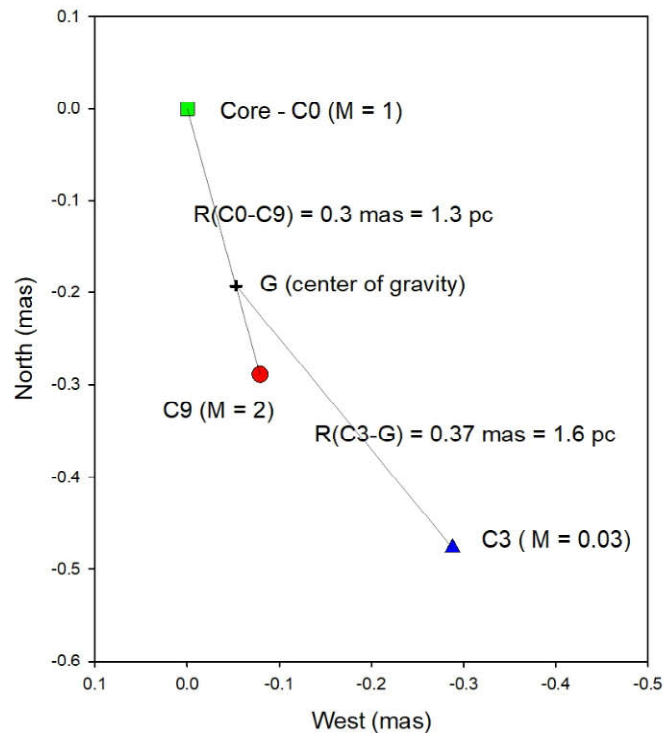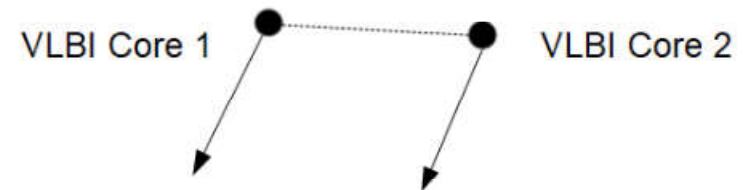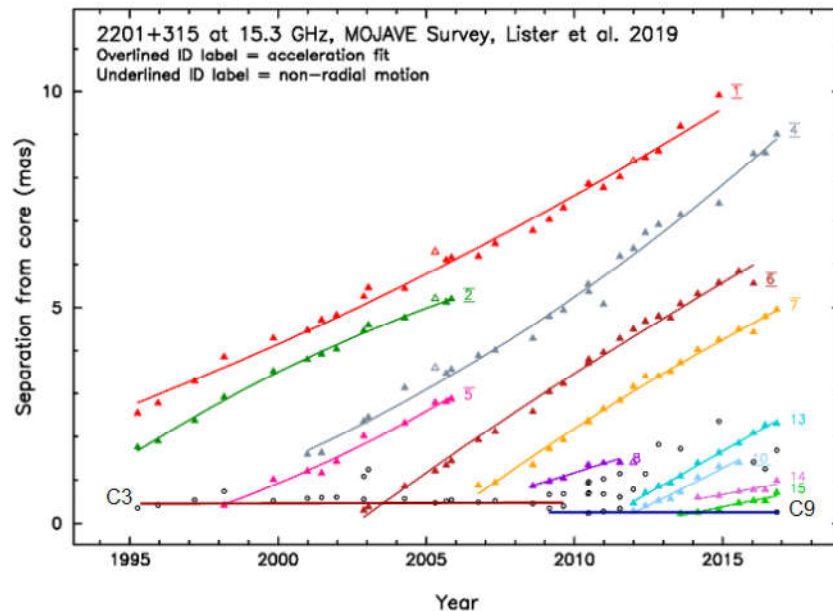# Structure and variability of quasars

Jacques ROLAND, GATTANO C., LAMBERT S. & TARIS F.

2201+315

2201+315 contains 3 black holes within 0.5 mas which eject VLBI components.

2201+315
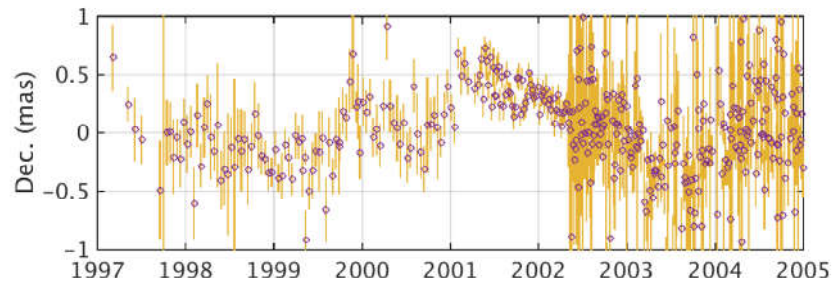

Two kinds of variability happen in the nucleus :

— the ejection of a new VLBI component which flux density can be larger
than the flux densities of the two stationary components, and

— in the case of a BBH system, the variations of the ratio of the flux
densities of the VLBI components associated with two black holes.

→ two different directions of variations

2201+315
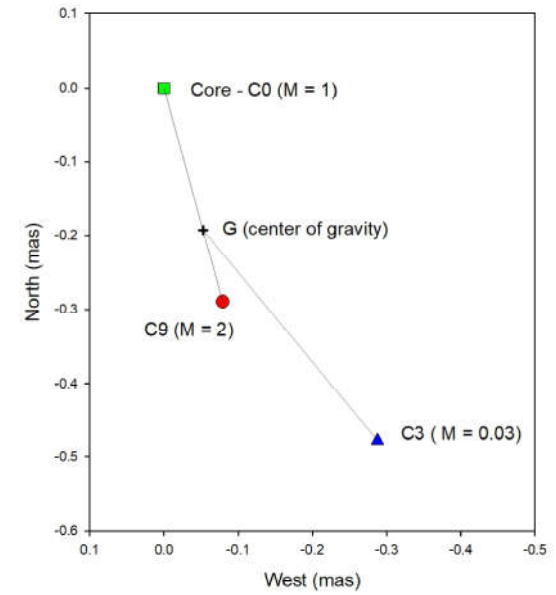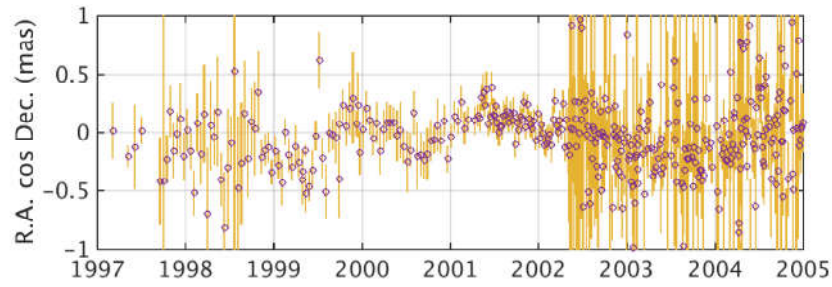
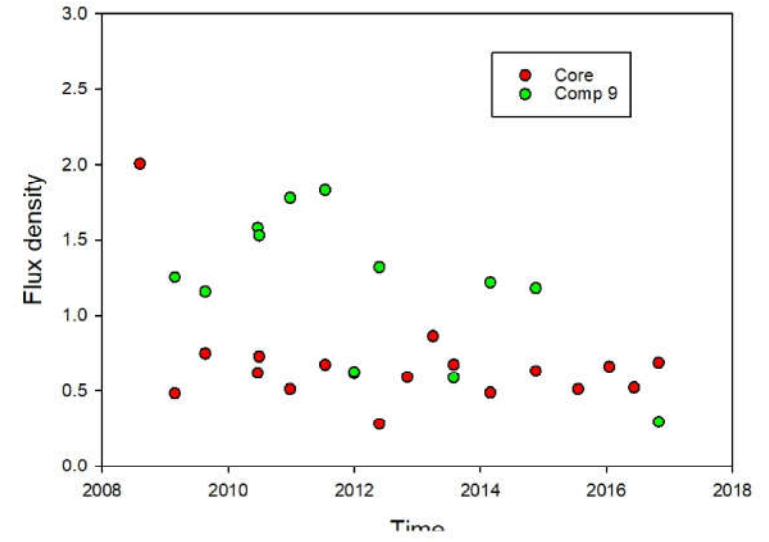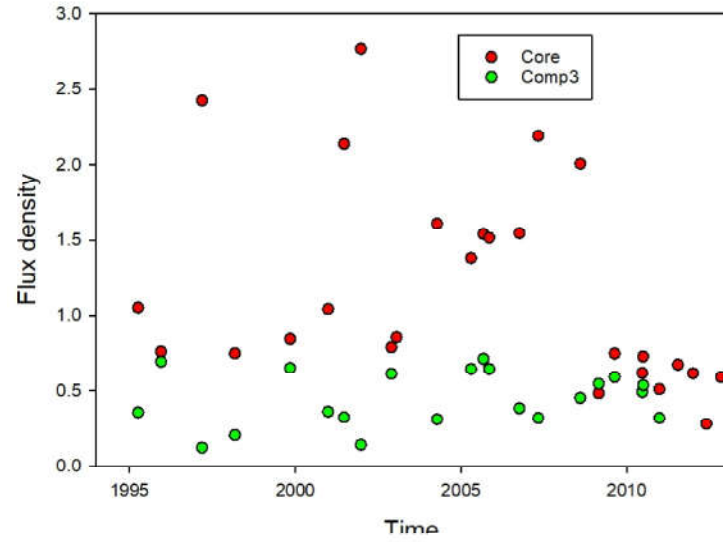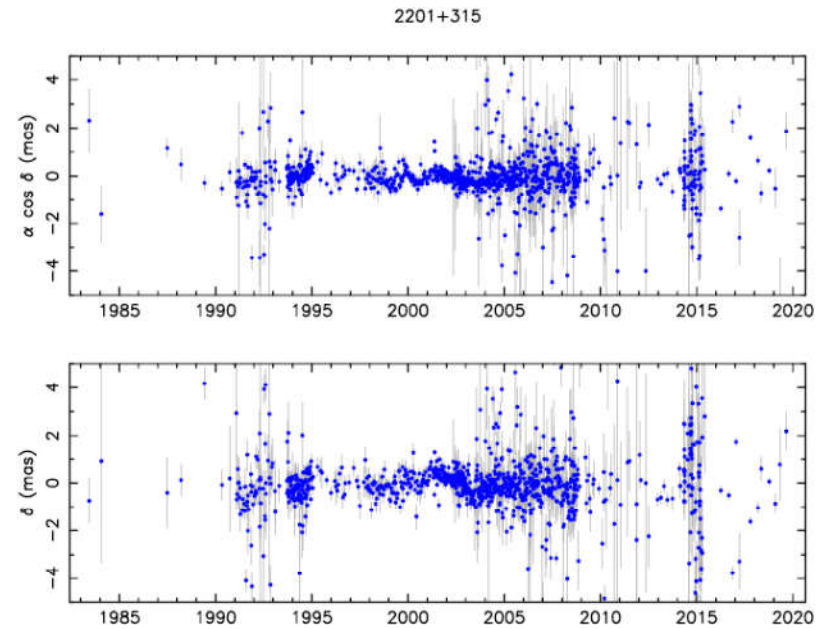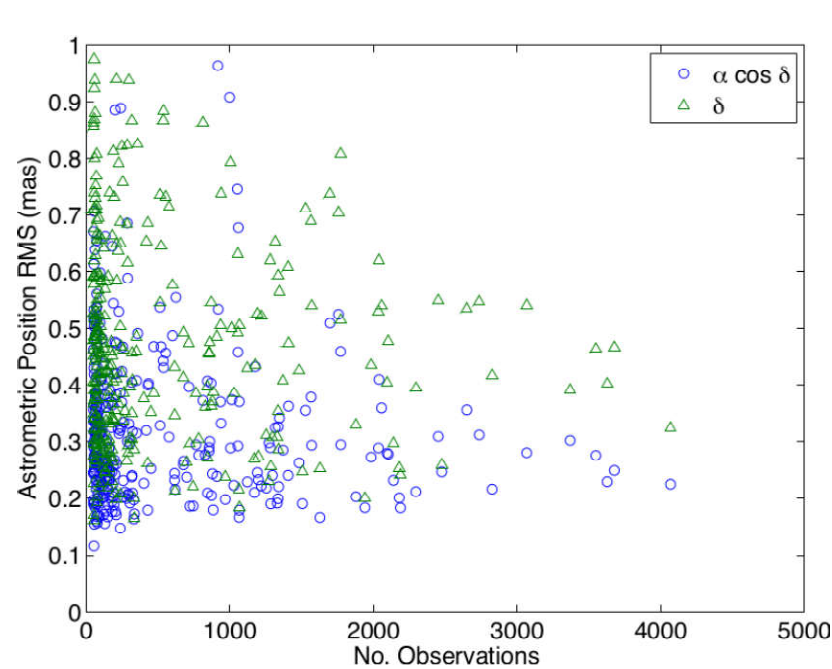-1) we need long term observations to observe the possible variations and the mean positon is going to move within a box which size is of order of the size of the BH system (if the two black holes are observed),

-2) the mean position does not correspond to any component of the BH system

-3) due to the complex structure of the nucleus the final error is not: Error/(N)^0.5

3C 120 – A bright and close radio galaxy
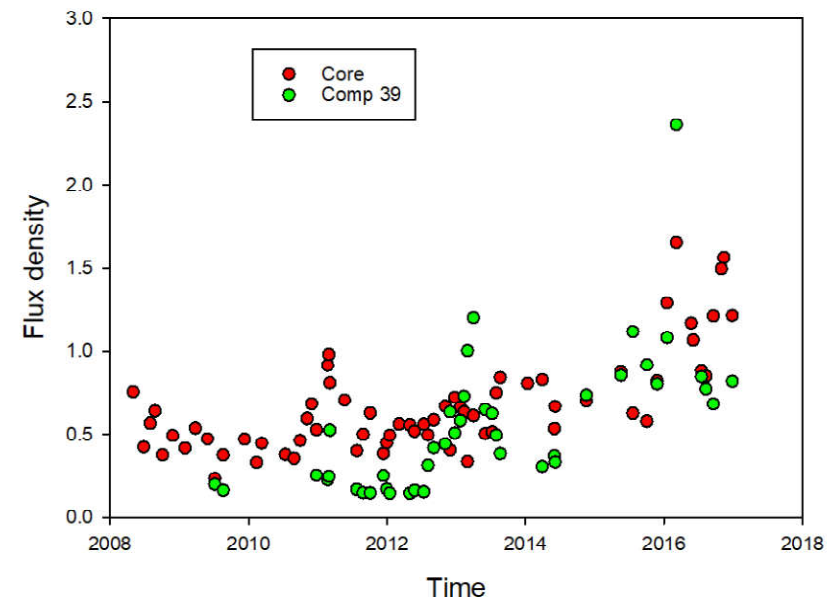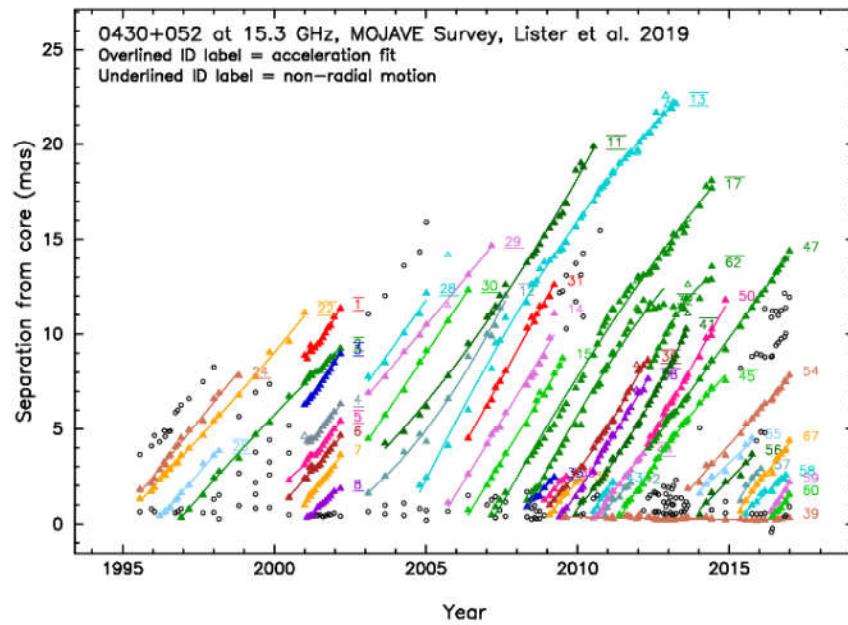
BHH system (binary black hole system)

Rbin = 0.269 mas = 0.175 pc

Last problem

- The core is the region of the VLBI jet which become transparent to synchrotron radiation

- The radio core and the GAIA core are different

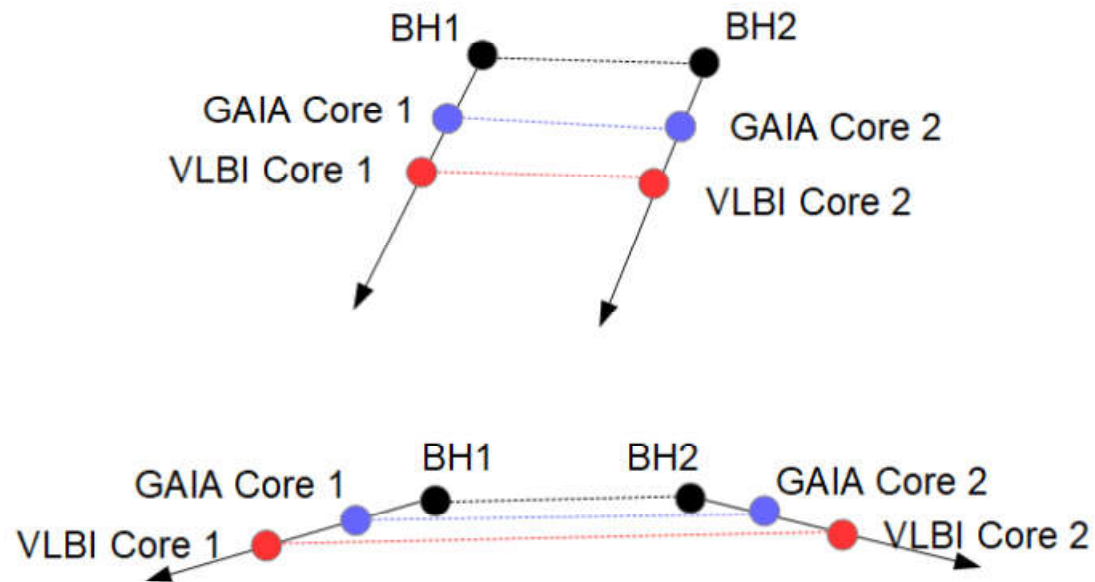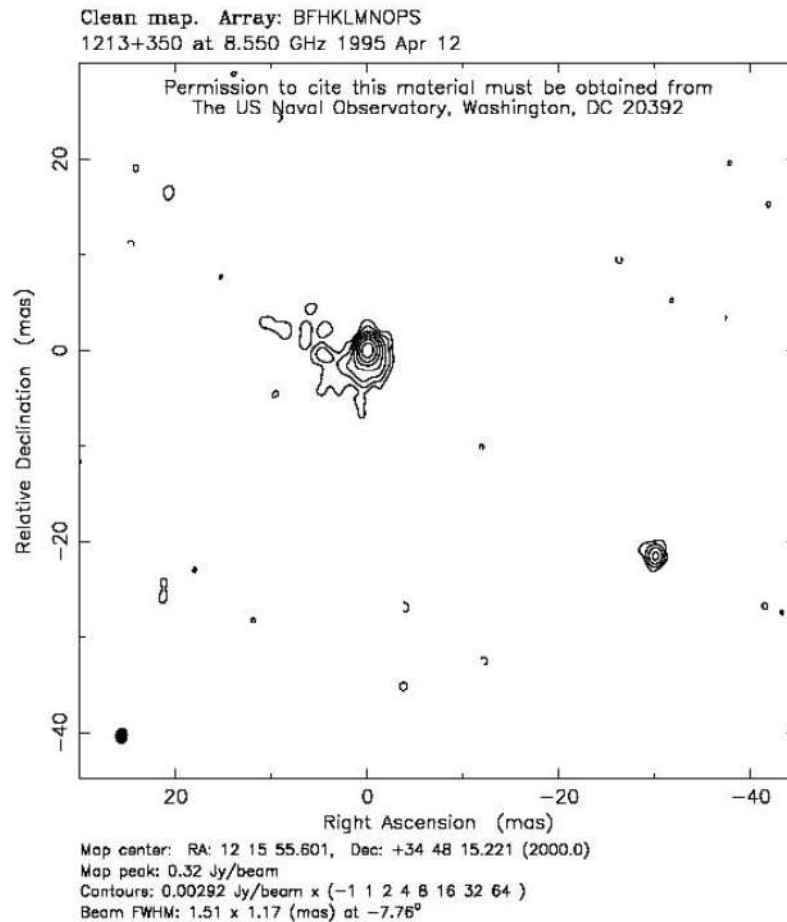In order to estimate and to compare the distances GAIA core 1 – GAIA core 2

and VLBI core 1 – VLBI core 2, one needs to compare a VLBI map with a GAIA map !

Clean map. Array: BFHKLMNOPS
1213+350 at 8.550 GHz 1995 Apr 12

For instance :

The VLBI map of 1213+350 shows two VLBI

components which flux densities are more

or less equal.

GAIA should detect both components but

the catalogue contains only one component !

Conclusion

-1) All nuclei of extragalacic radio sources contain probably BBH systems

  (all radio galaxies are associated with elliptical galaxies which are the

   result of mergings)

-2) Their structure is complex and variable with time

-3) To make a precise link between the ICRF3 and the GAIA reference

   frame, one needs :

   - observations during long periods to study their variability and one

   cannot use simply the mean position (if the position is variable),

   - VLBI maps to determine their structure and their variability

   - GAIA maps to compare them with the VLBI maps