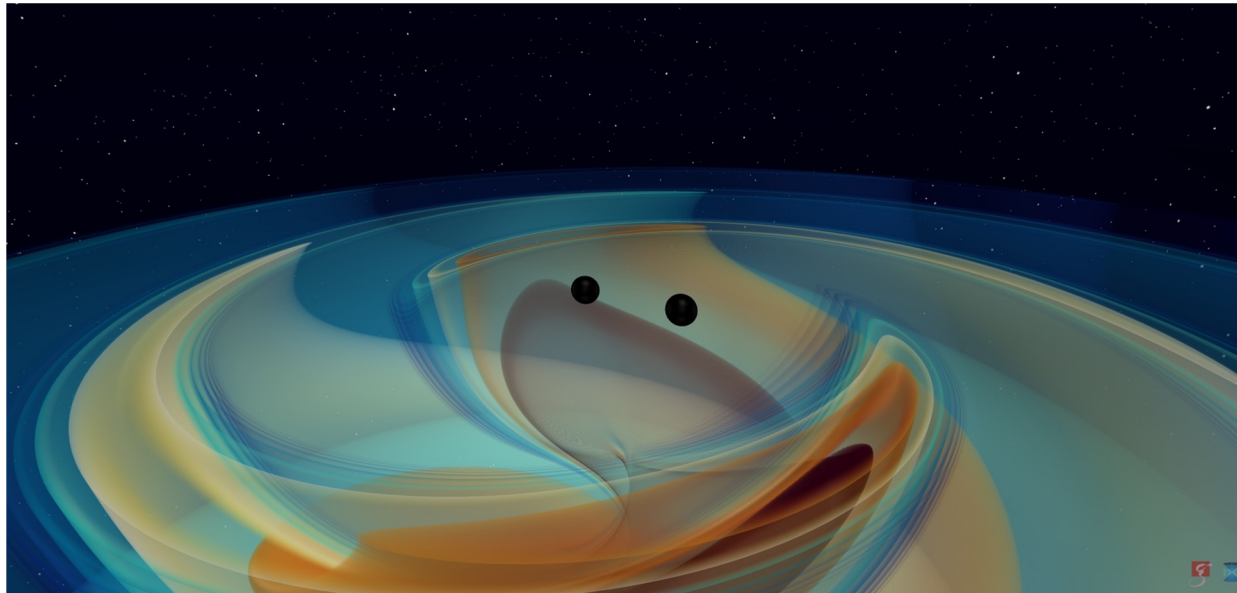
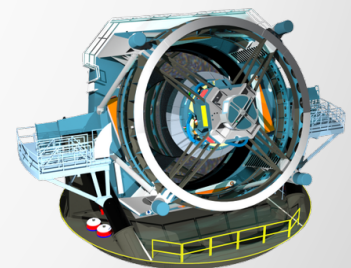


Gravitational wave group

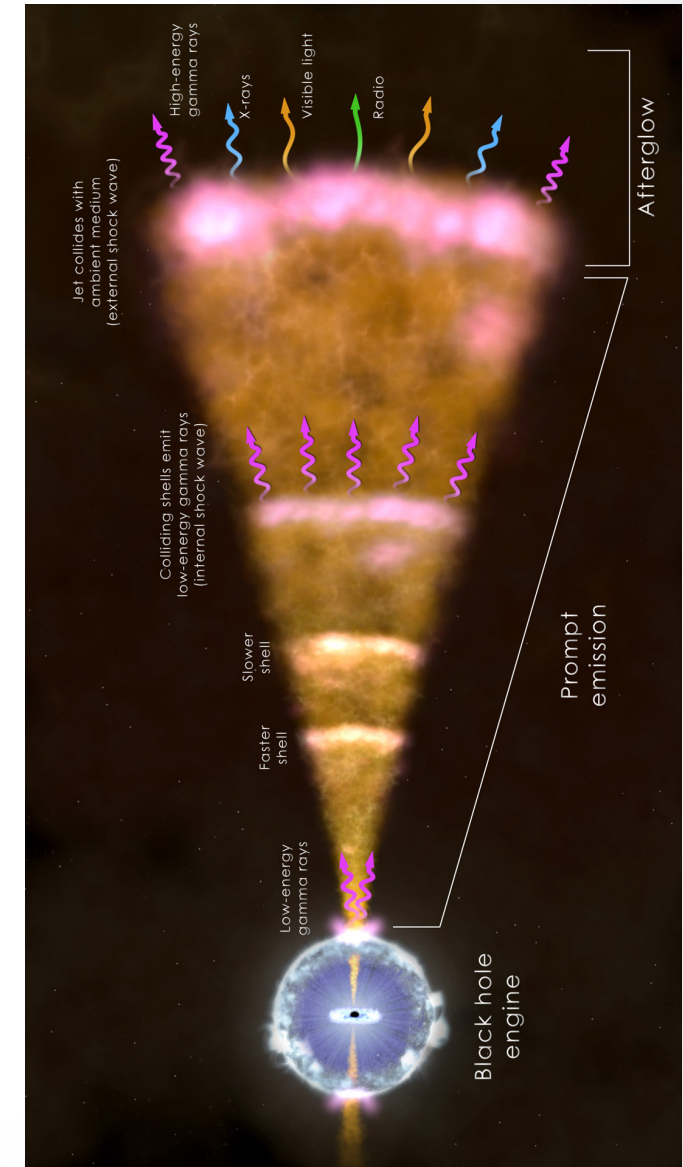
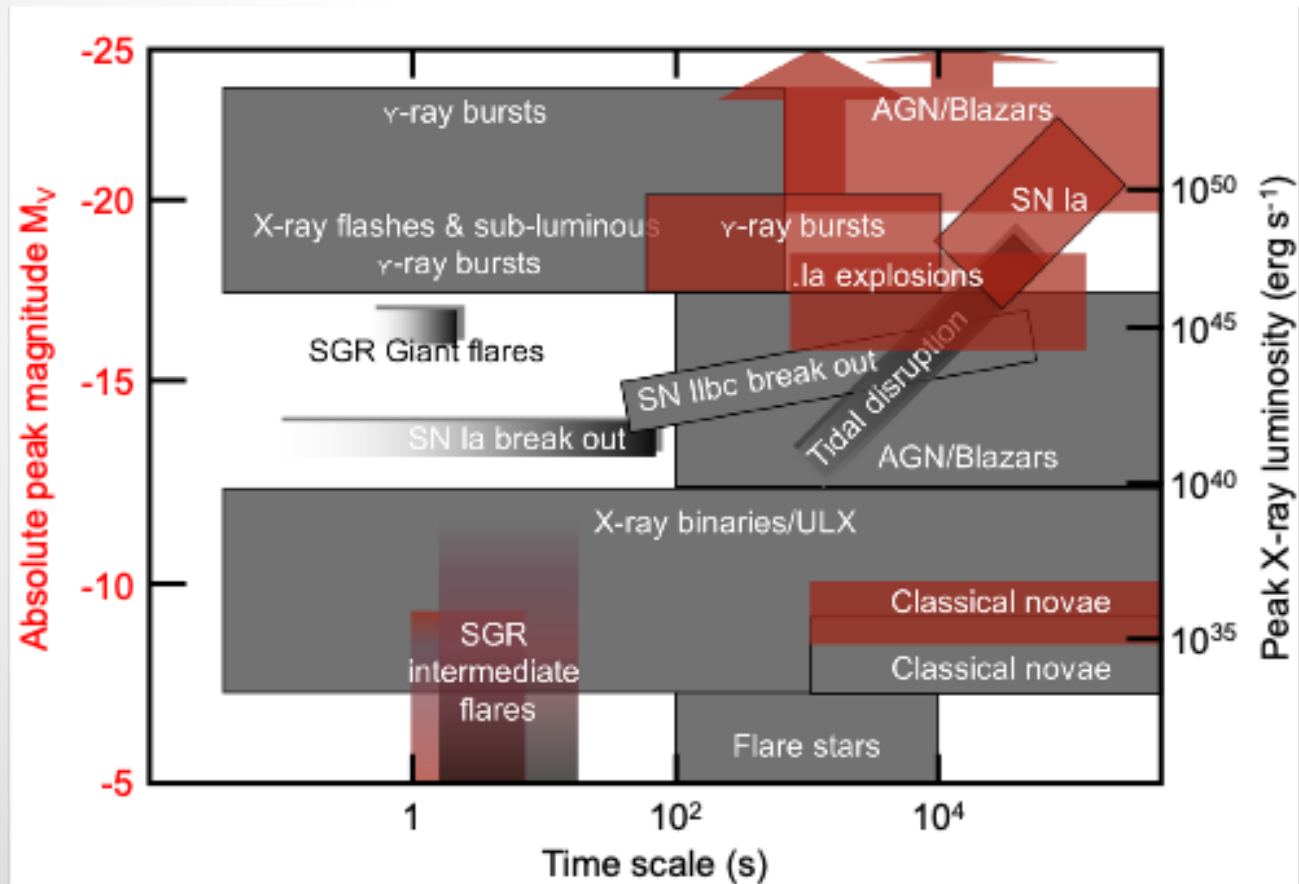


Nicolas Leroy for the GW group
nicolas.leroy@ijclab.in2p3.fr



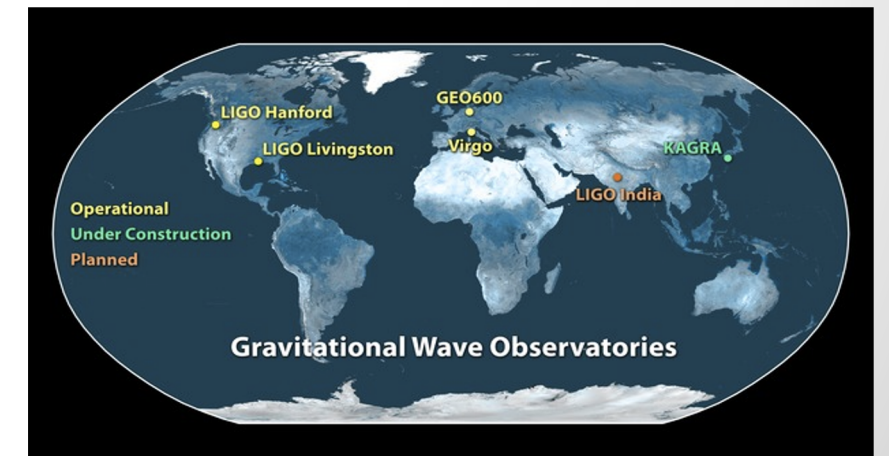
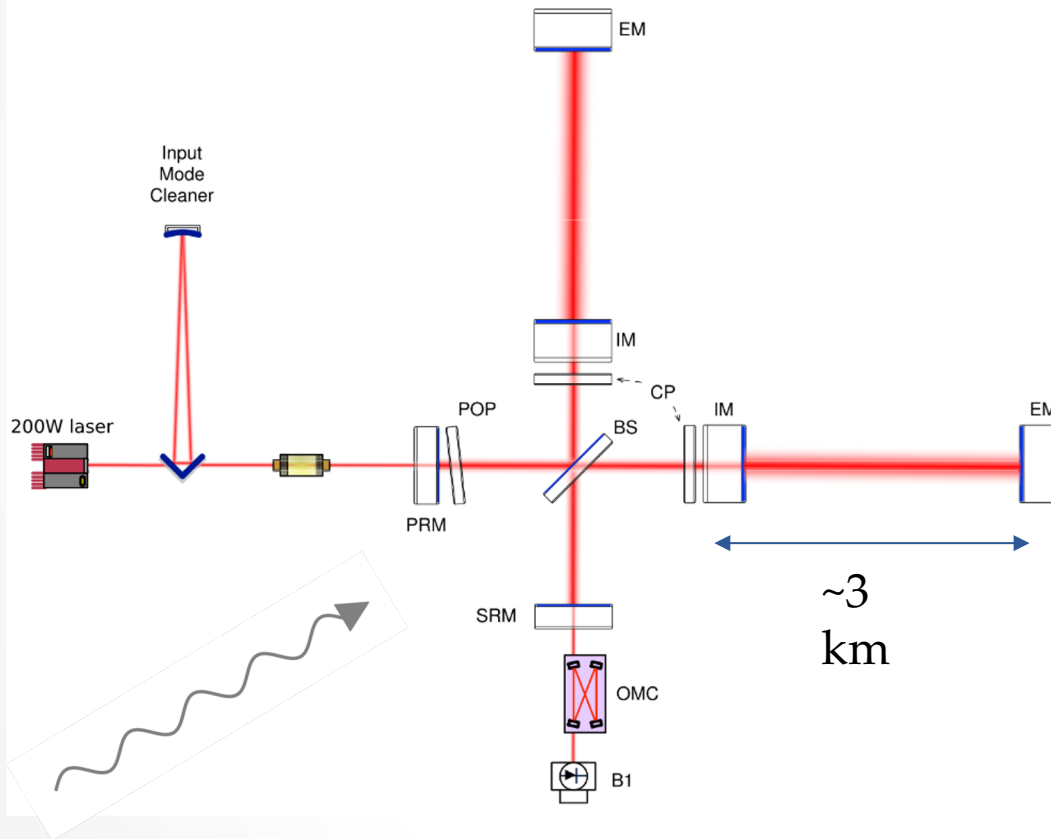
Transient sky and time domain astronomy

- Most powerful events with compact objects
- Possible counterpart in EM with explosive transients

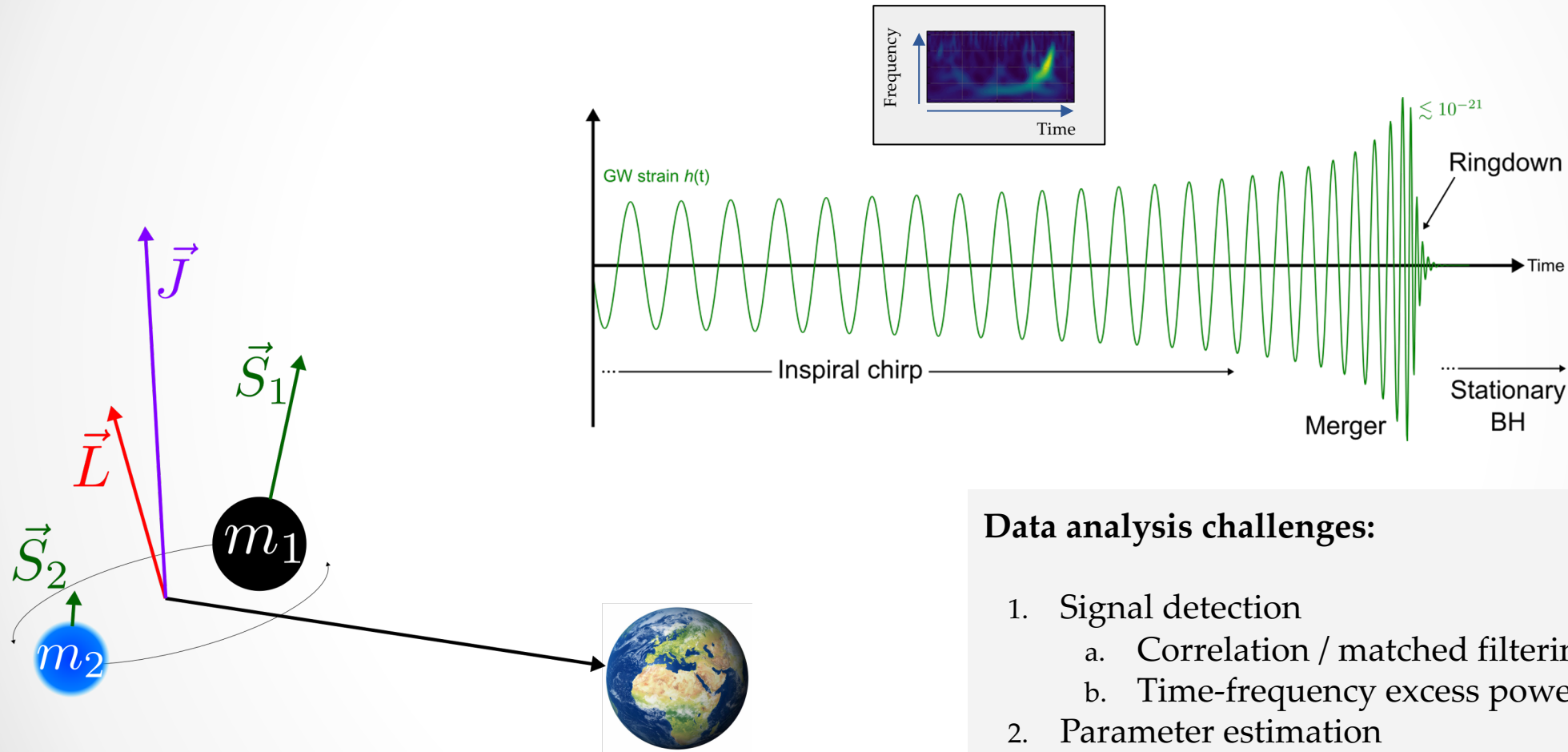


GW detectors

Test
mass



GW astronomy

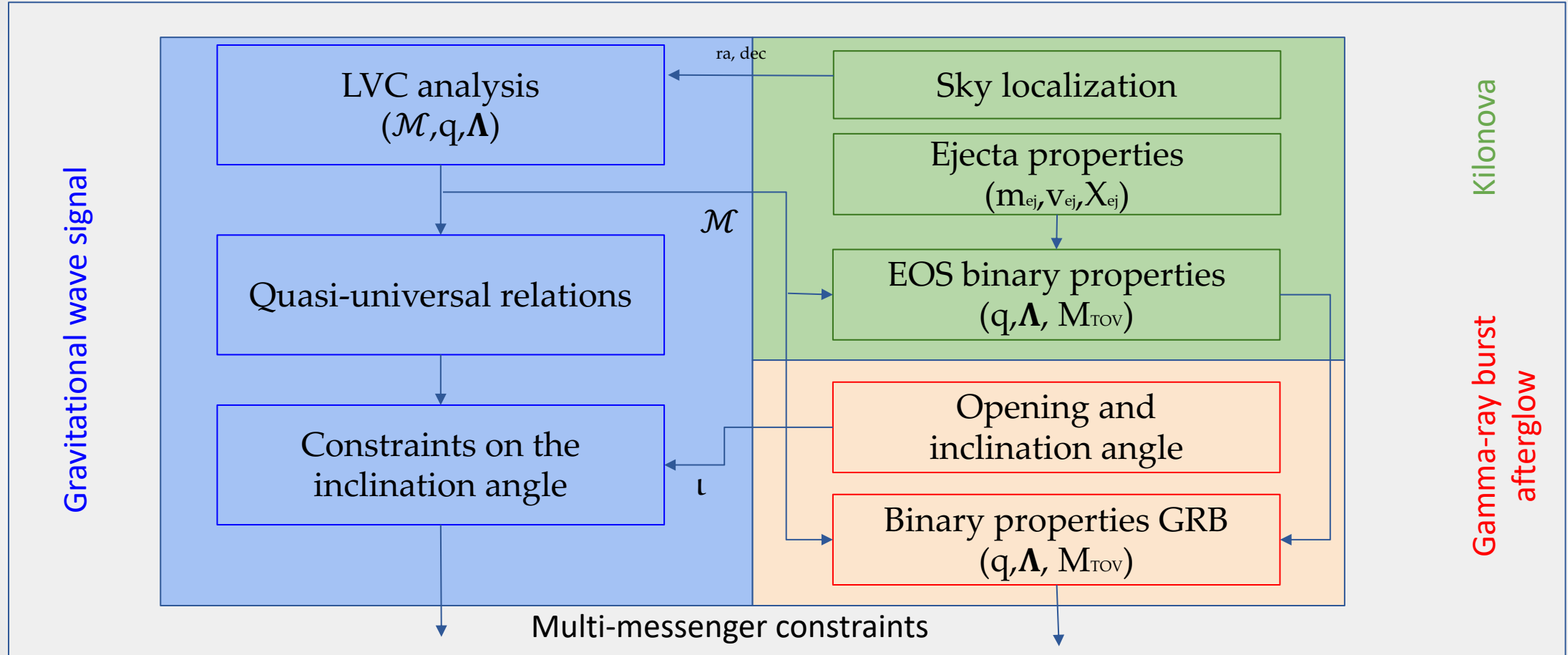


Data analysis challenges:

1. Signal detection
 - a. Correlation / matched filtering
 - b. Time-frequency excess power
2. Parameter estimation
 - a. Bayesian formalism



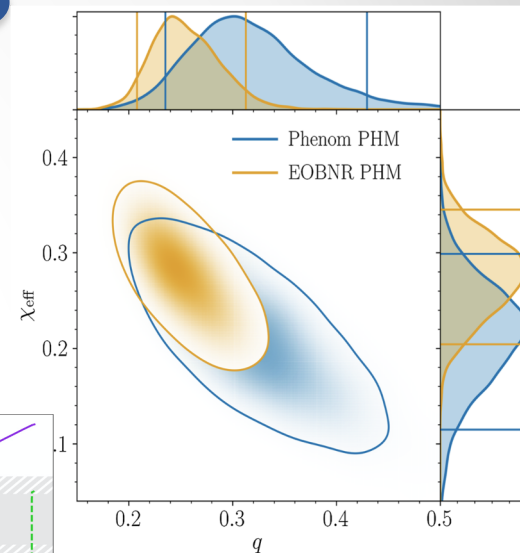
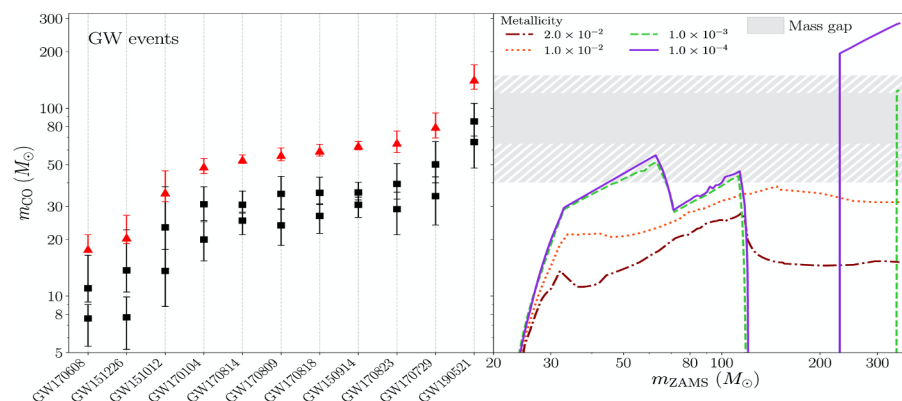
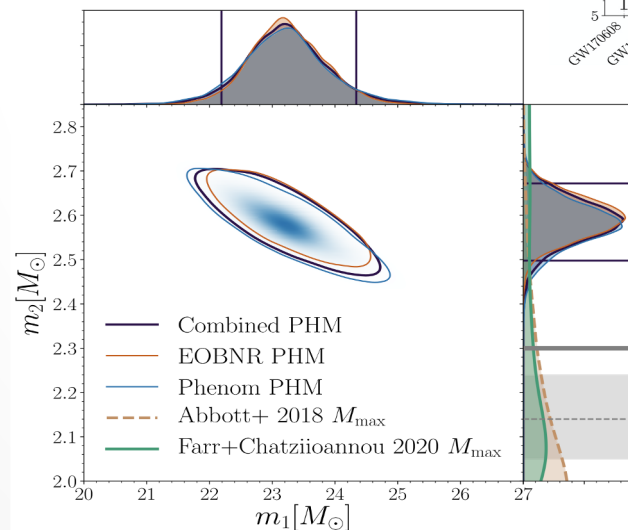
Multimessenger



Need to access both GW side and EM observatories on a large fraction of the electromagnetic band

Recent GW detections

- GW190412 :
 - first observation of binary black hole with unequal masses : $35 + 10 M_{\text{sun}}$
 - First observation of higher order modes
- GW190425 :
 - Massive neutron stars ?
- GW190521 :
 - Massive BBH
 - Progenitor in pair-instability mass gap
- GW190814 :
 - First NSBH ?
 - Or very light BH

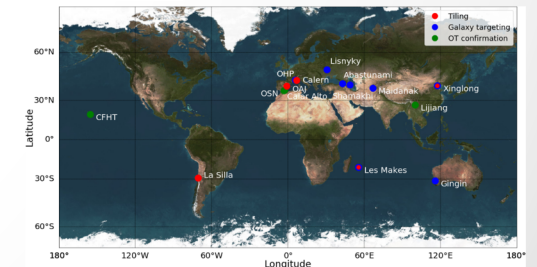
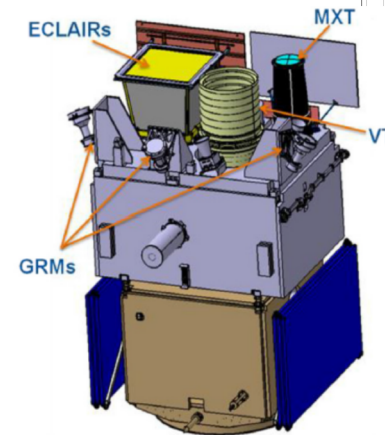
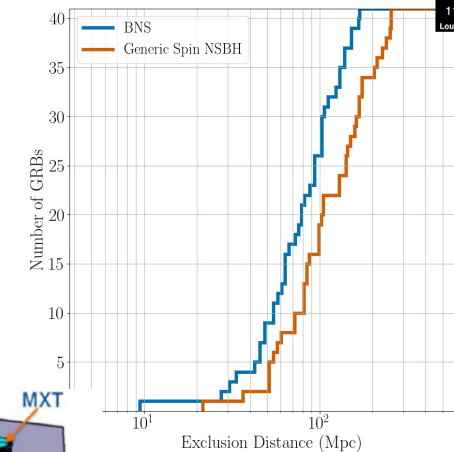
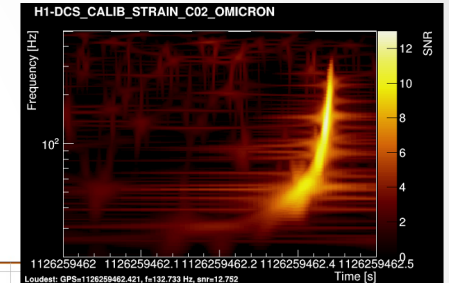
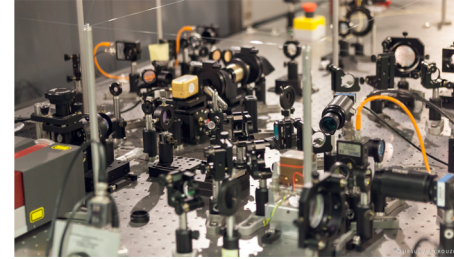


**Lot of new physics/astrophysics
to be done**

GW team at IJCLab

- Improving Virgo's sensitivity using squeezed light (CALVA)
- Virgo detector characterization and data quality investigations
- Analysis of LIGO/Virgo data to search for compact binaries, cosmic strings or in coincidence with a GRB
- Electromagnetic counterparts to GW events (SVOM, GRANDMA, Fermi/GBM, Vera Rubin Obs.)
- GRB physics with SVOM and Fermi

- 8 permanents
- 4 PhD students



Our propositions

- Timeline for next years :
 - O4 run will start in 2022 and last for a year
 - SVOM will launch in Feb 2023
 - LSST will start observation in 2023
- M2 internship :
 - Recherche de sursauts gamma avec SVOM/MXT – Florent Robinet florent.robinet@ijclab.in2p3.fr
 - GW analysis with GRB – Tito Dal Canton tito.dalcanton@ijclab.in2p3.fr
- We are also preparing PhD subjects within the group on transient sky analysis