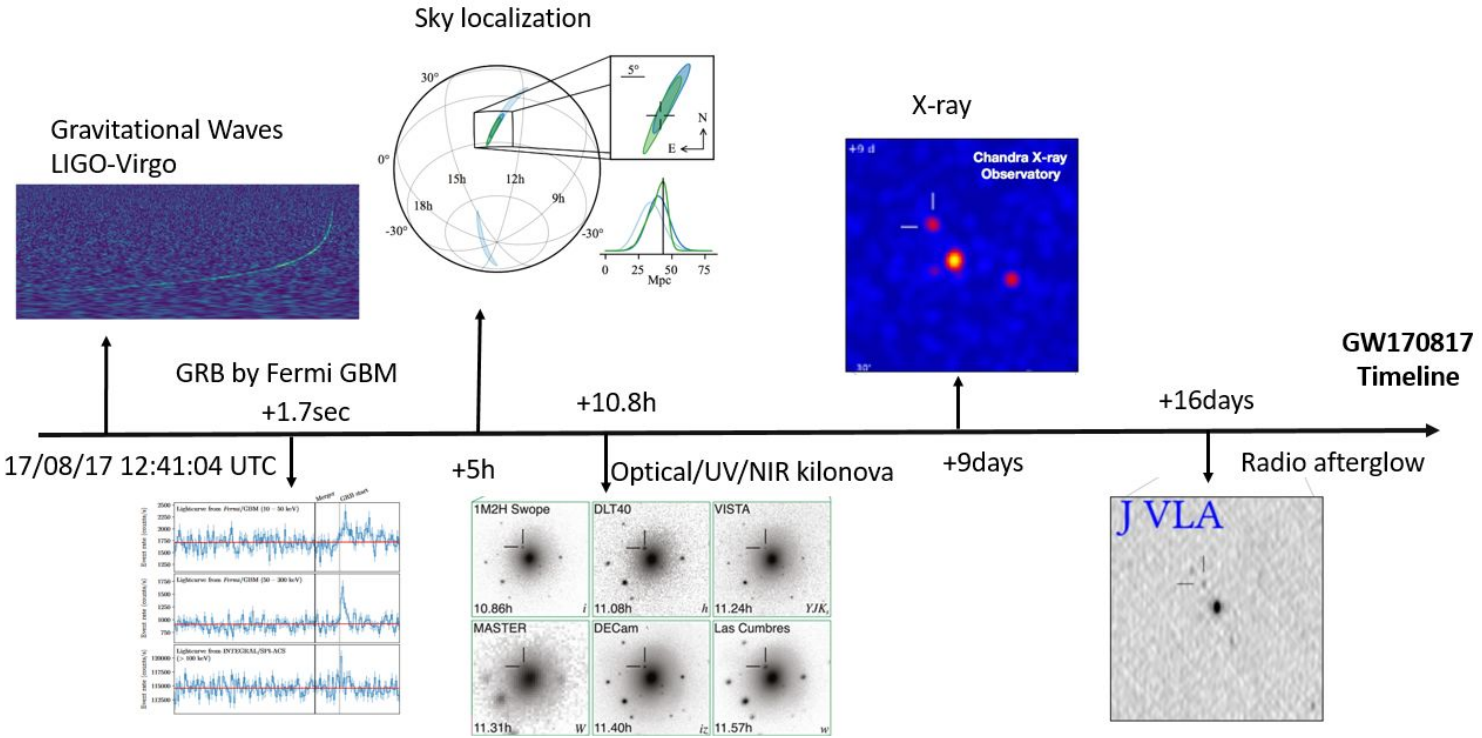
Extreme Universe TSP

ESCAPE science project for EOSC-Future

Why Extreme Universe?

- Extreme astrophysical phenomena bring information through different messengers: Gravitational Waves, GRB, Electromagnetic radiation , Neutrino...
- New facilities running in few years and other under construction
- Big astroparticle data to analyze
- Collaboration, cooperation efforts to maximize the scientific knowledge
- Interaction between theoreticians, data analysts and computer scientists
- New paradigm towards EOSC

Example of MMA: GW170817 detection and EM follow up



Pilot projects

Main Research Area	Objects/sources	Messengers	ESF/RI involved	ESCAPE services EOSC-Future integrations	Data Analysis tools (AI,ML)	Pilot project(s)	Computing resources required	Partner PM involved
Compact objects	*Pulsars, FRBs, Off-nuclear AGN*	*radio, optical, X-ray, …*	*LOFAR...*	*Multiwavelength platform/Software catalogue,VO tools*	*Data science, Machine Learning*	*1) Radio astronomy: FRBs, pulsars, plerions, off-nuclear AGN*	*Compute cluster, Jupyter hub, Rucio Data lake*	*42 PM Astron/UvA*
High energy Astrophysics	*GRBs, jets, AGN, BNS, CCSN*	*neutrinos, gamma-ray, radio,X-ray, GW,...*	*CTA, Virgo, KM3NET, SKA,LSST*	*Multimessenger platform/Software catalogue,... Virtual Observatory tools*	*Model comparison, Machine Learning*	*1)GRB/neutrino/GW analysis, 2) Blazar MWL/neutrino*	*GPU cluster Jupyter hub*	*12 PM UvA, 6 PM FAU. 4 PM CNRS , 24 PM SNS*
Fundamental physics	*Dark matter, GR, Primordial Universe*	*GW,*	*Virgo, Einstein Telescope*	*Template banks, generation software,...*	*Machine learning approach*	*1) DM template bank and ML analysis pipeline*	*GPU cluster Jupyter hub*	*10 PM INFN,12 PM UvA, 12 PM SNS, 2 PM FAU ...*

On going projects

- High Energy astrophysics: *Multi-messenger platform (SNS, A. Iess)*
- Compact objects: *a multi-wavelength search cloud platform (ASTRON, Dany)*
- Detecting DM with Einstein Telescope (UvA and SNS, A. Parisi)
- IRF from KM3NeT for DM and EU purposes (FAU, Mikhail Smirnov)
- Study of angular correlation signatures induced on GW stochastic background by lensing effects (INFN, G.Cella giancarlo.cella@pi.infn.it)
- GRB and AGN (UvA) (S. Merkoff, S.B.Markoff@uva.nl)

Link to living slides