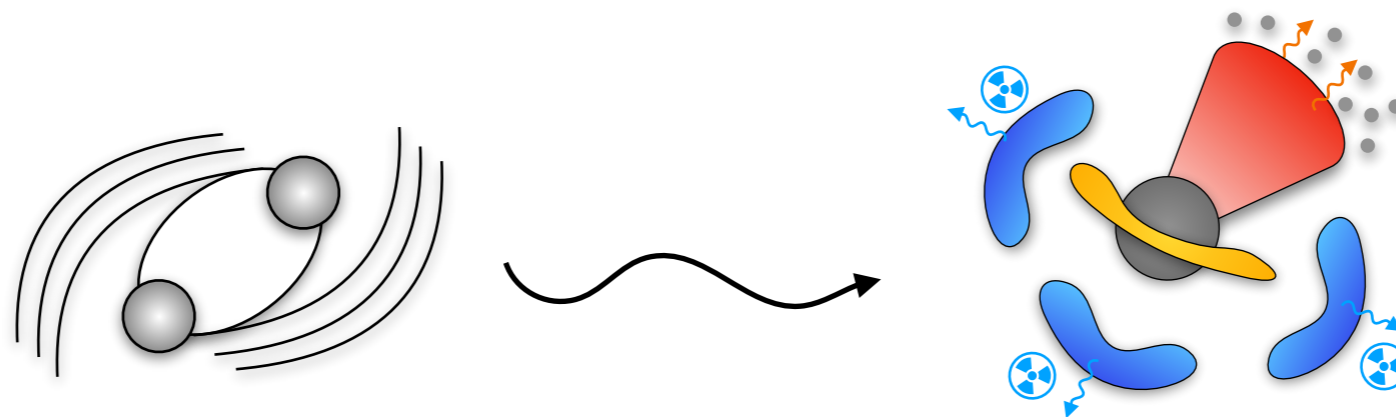


Multi-Messenger Observations in the ET Era: Binary Neutron Star and Black Hole - Neutron Star Mergers



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Om Sharan Salafia, Giancarlo Ghirlanda, Bruno Giacomazzo, Monica Colpi, Francesco Iacovelli, Fabio Ragosta, Silvia Piranomonte, Andrea Melandri, Raphael Duque, Floor Broekgaarden, Michele Mancarella, Igor Andreoni, Tassos Fragos, Andrew Levan and others...

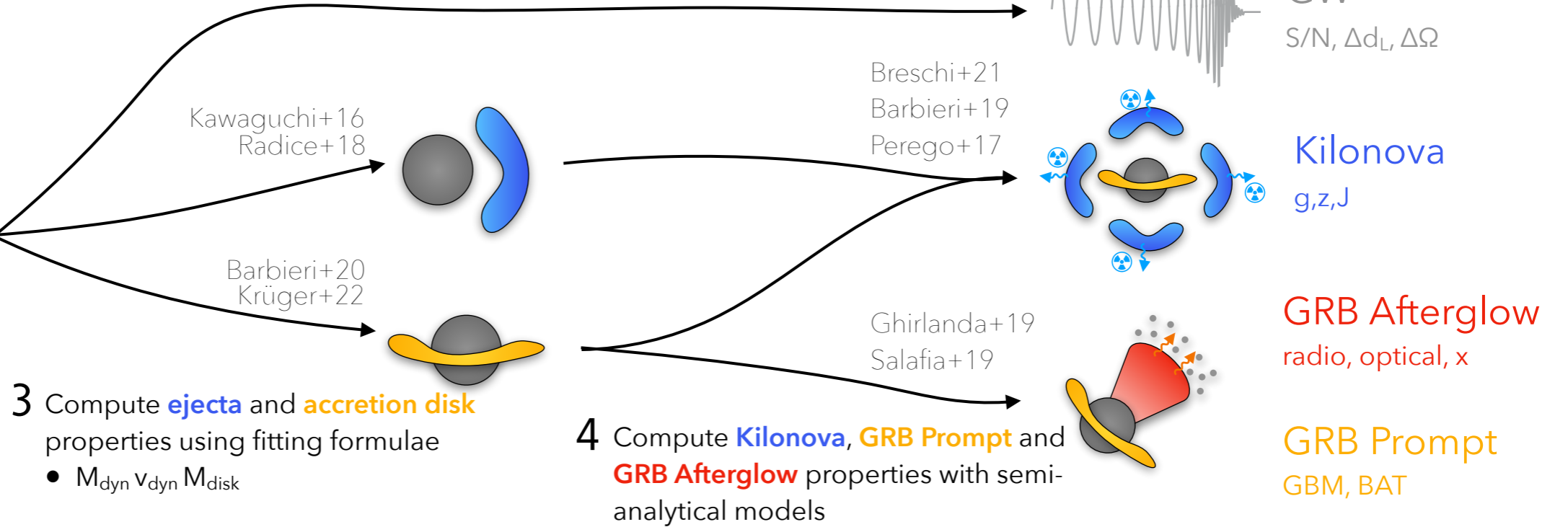
Our model

1 Let's start from a population of merging **NSNS** or **BHNS**

- Mass distribution
- Redshift distribution
- BH spin
- NS EoS

2 Compute the **GW signal** using GWFAST

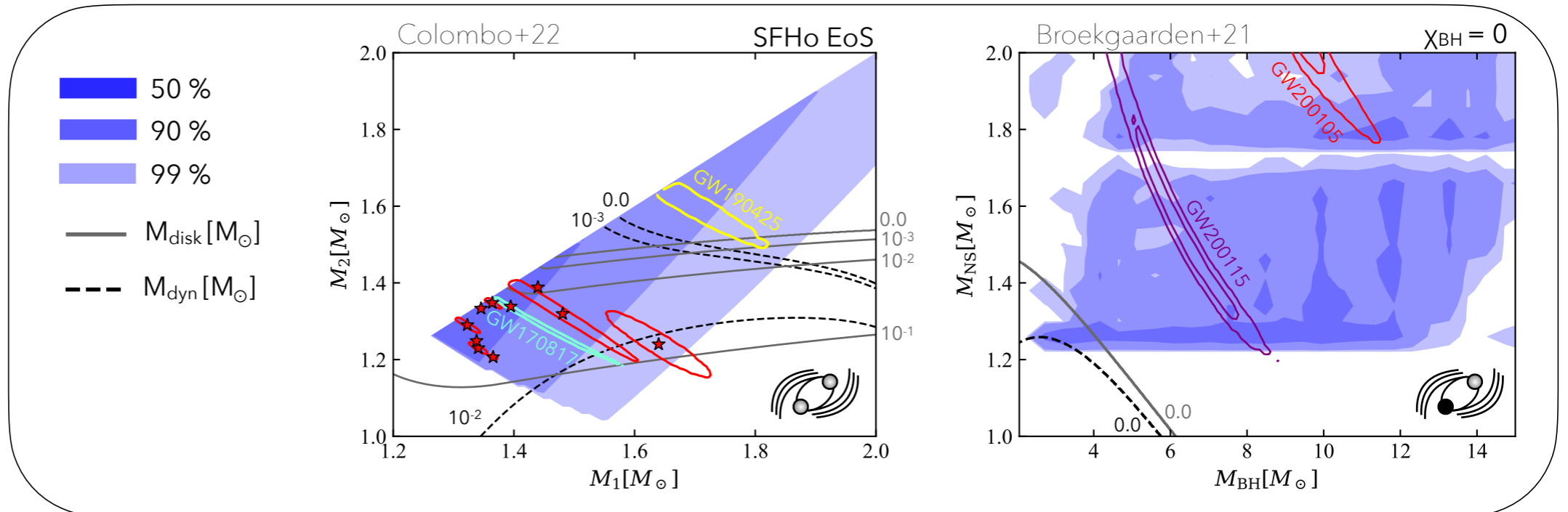
- IMRPhenomNSBH
- IMRPhenomD_NRTidalv2
- delta, 2L, CE
- 85% duty cycle



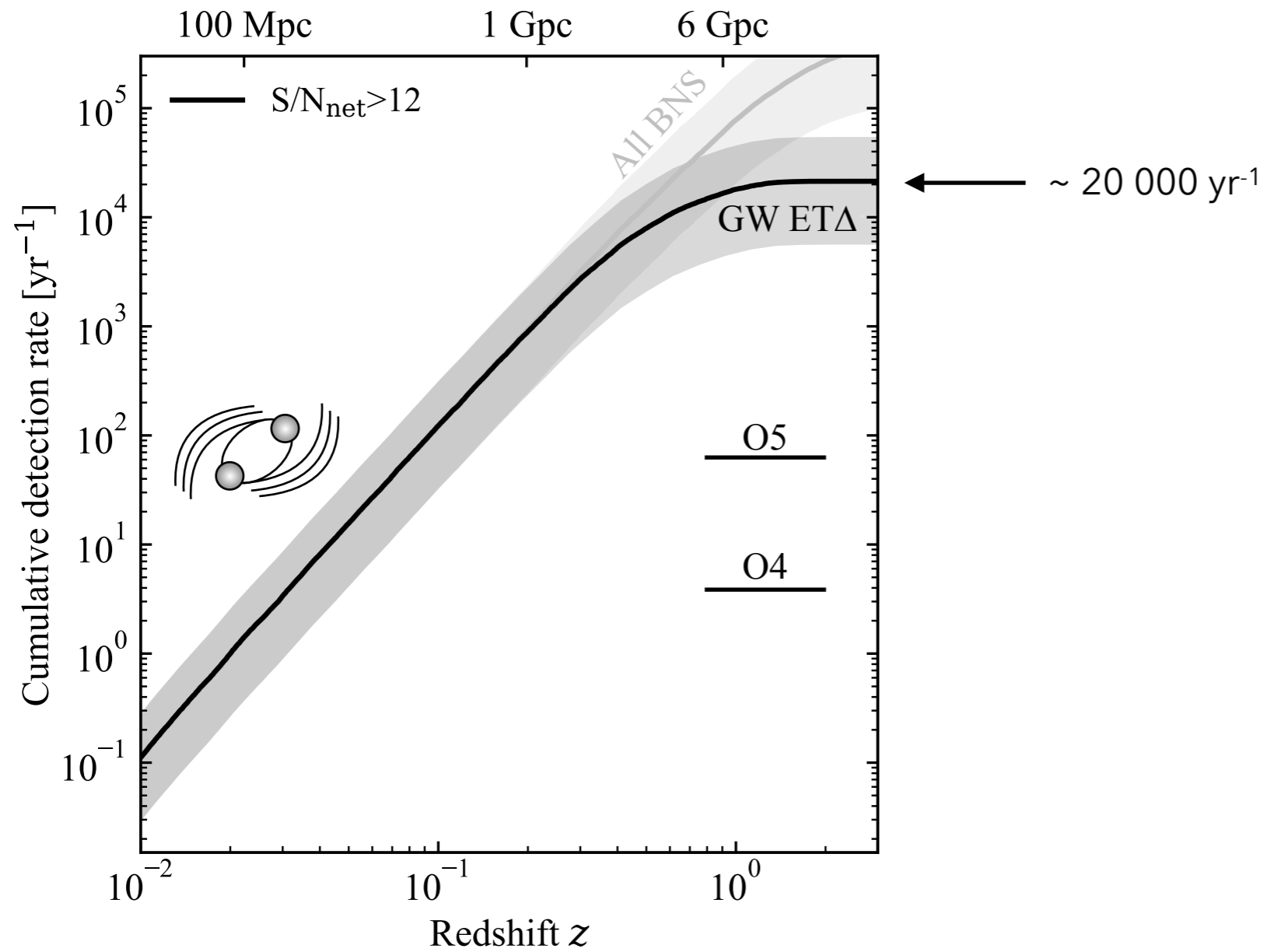
3 Compute **ejecta** and **accretion disk** properties using fitting formulae

- $M_{\text{dyn}} v_{\text{dyn}} M_{\text{disk}}$

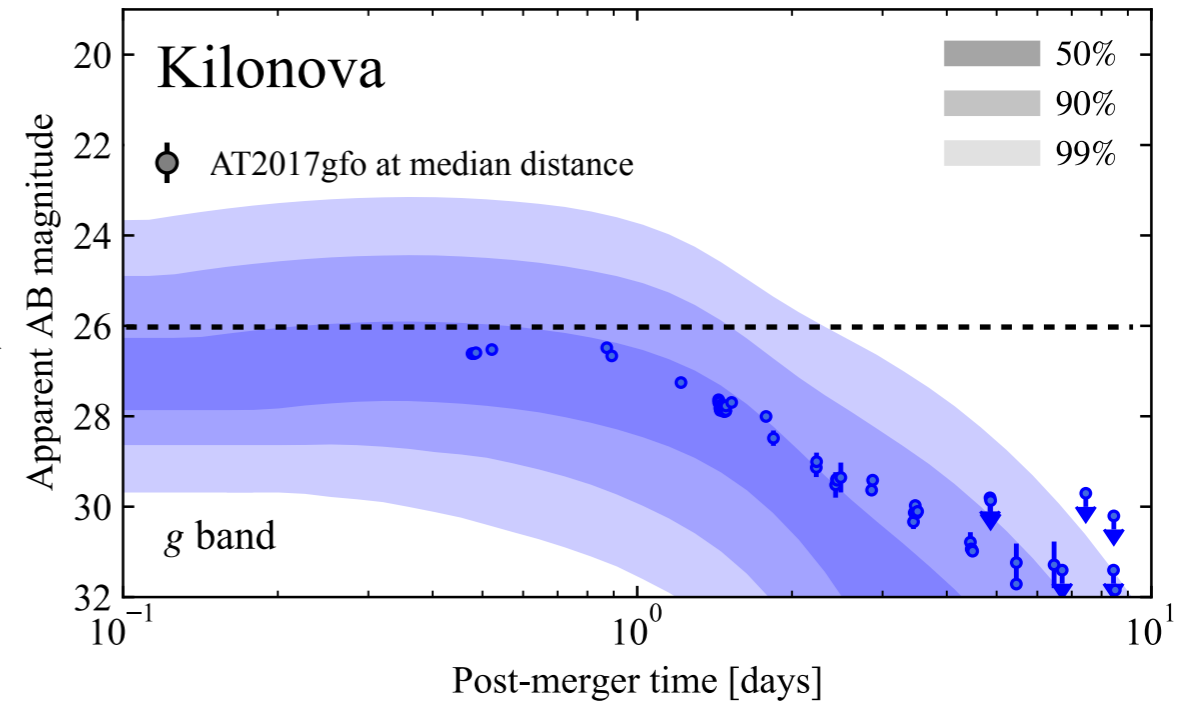
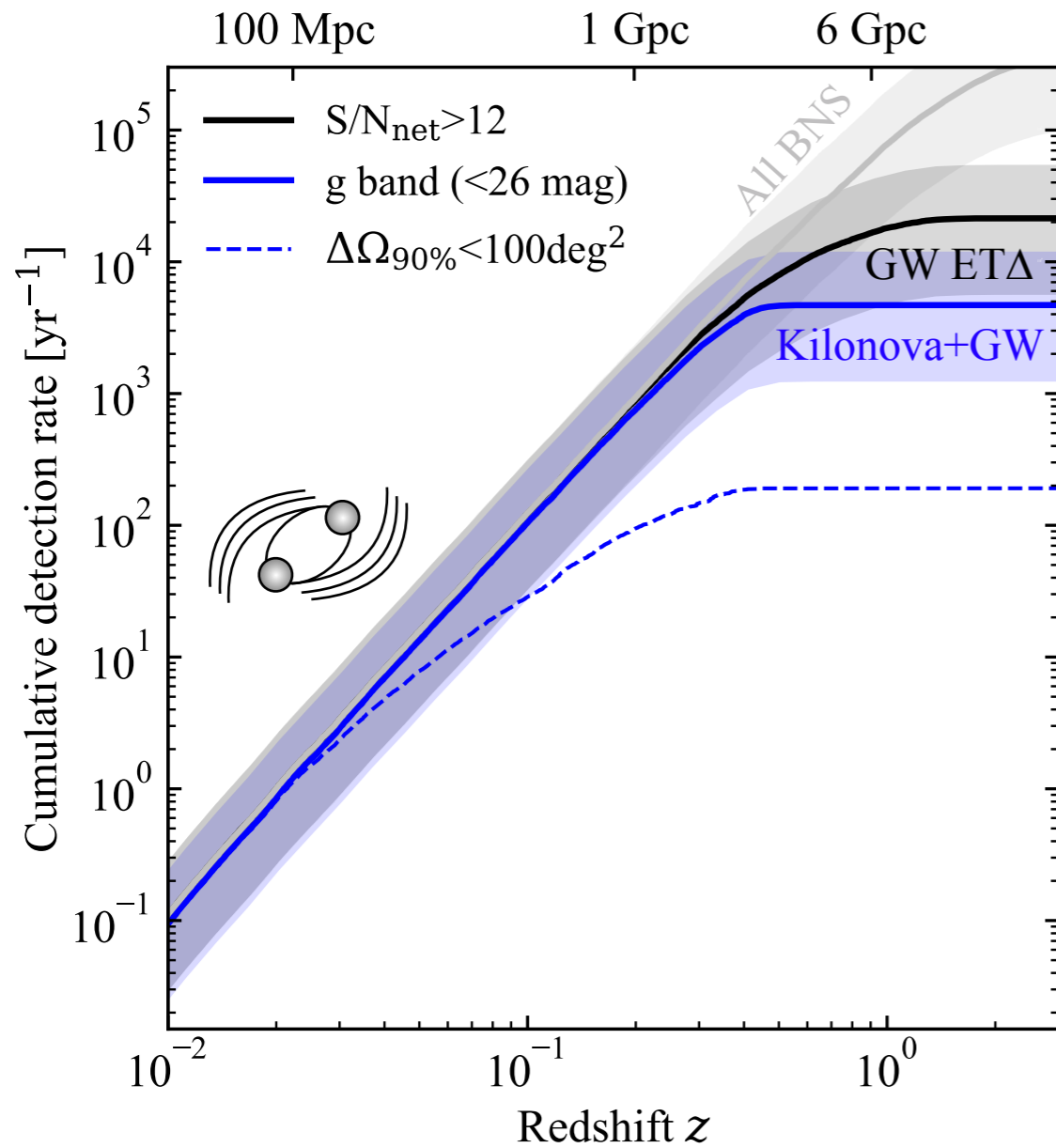
4 Compute **Kilonova**, **GRB Prompt** and **GRB Afterglow** properties with semi-analytical models



Multi-messenger observations with ET: BNS

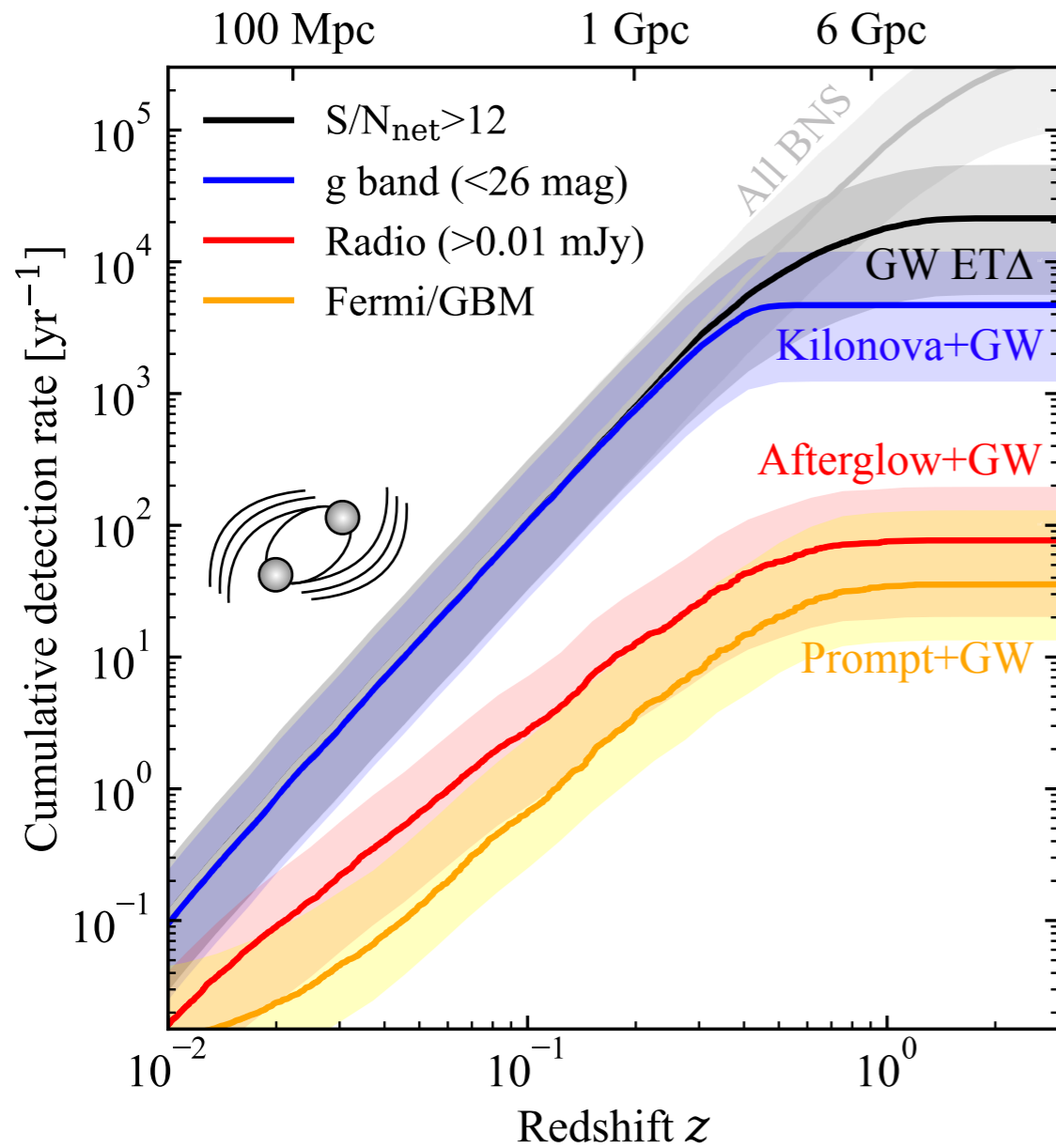


Multi-messenger observations with ET: BNS



See Loffredo's talk in a few minutes!

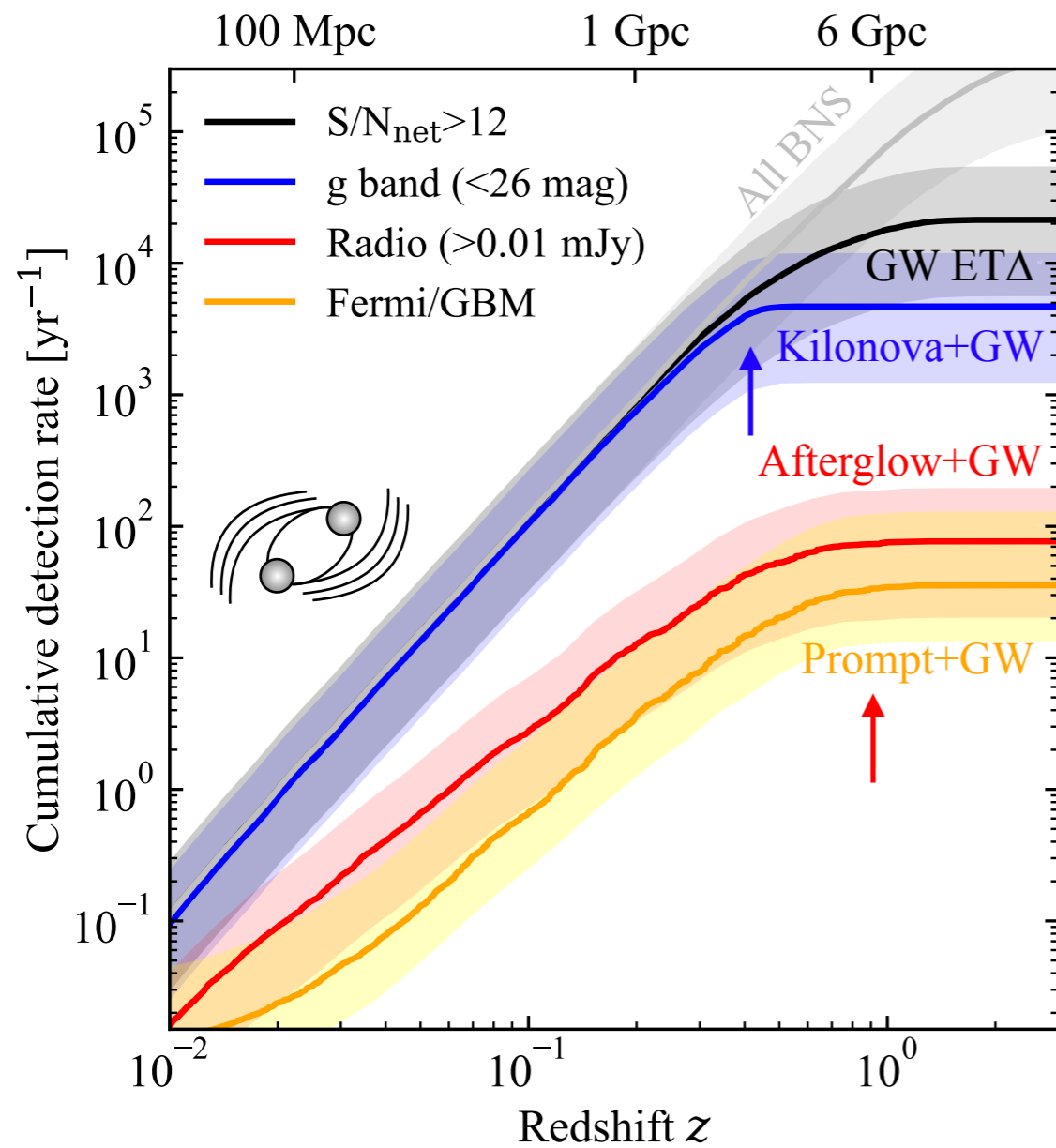
Multi-messenger observations with ET: BNS



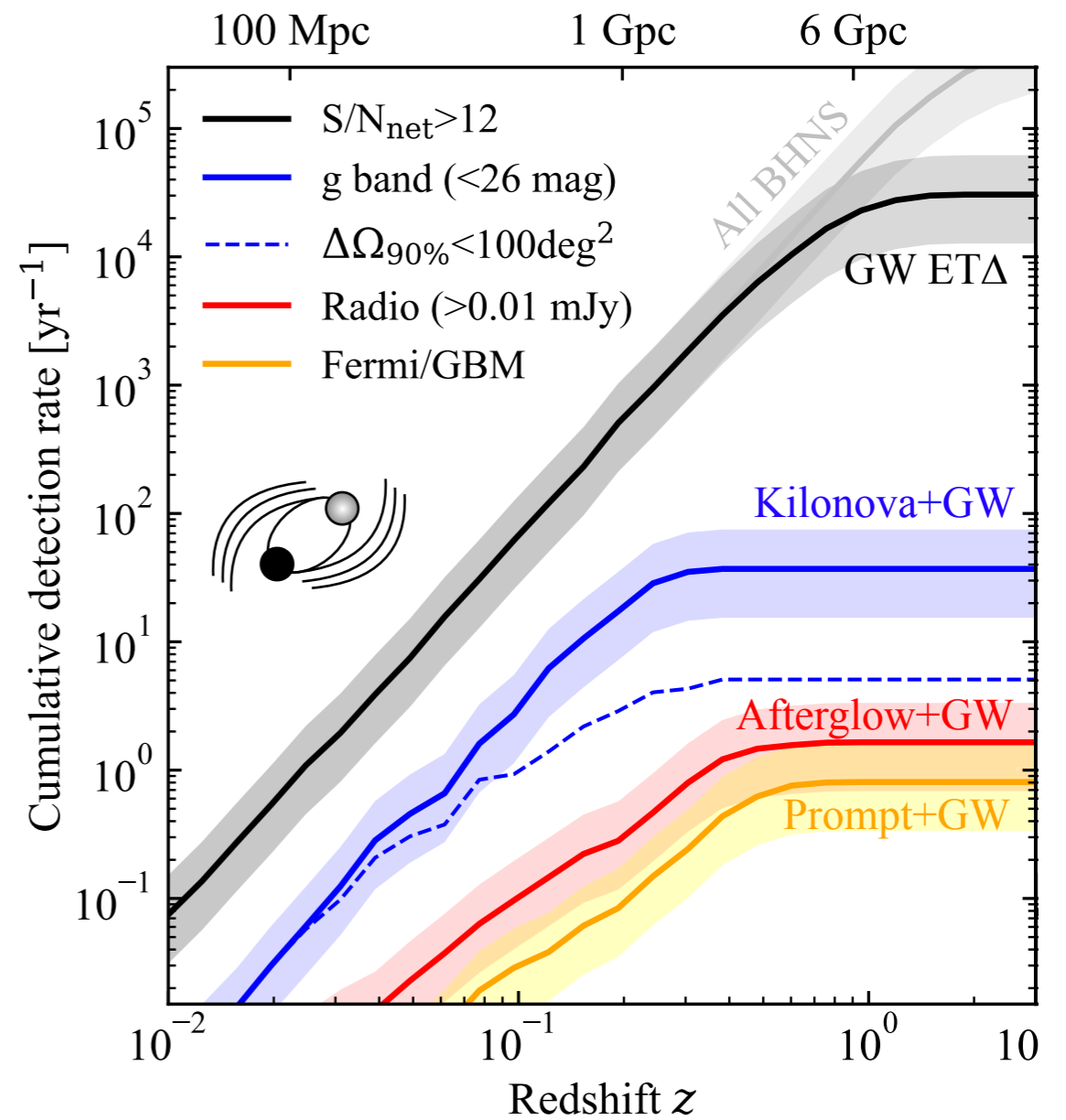
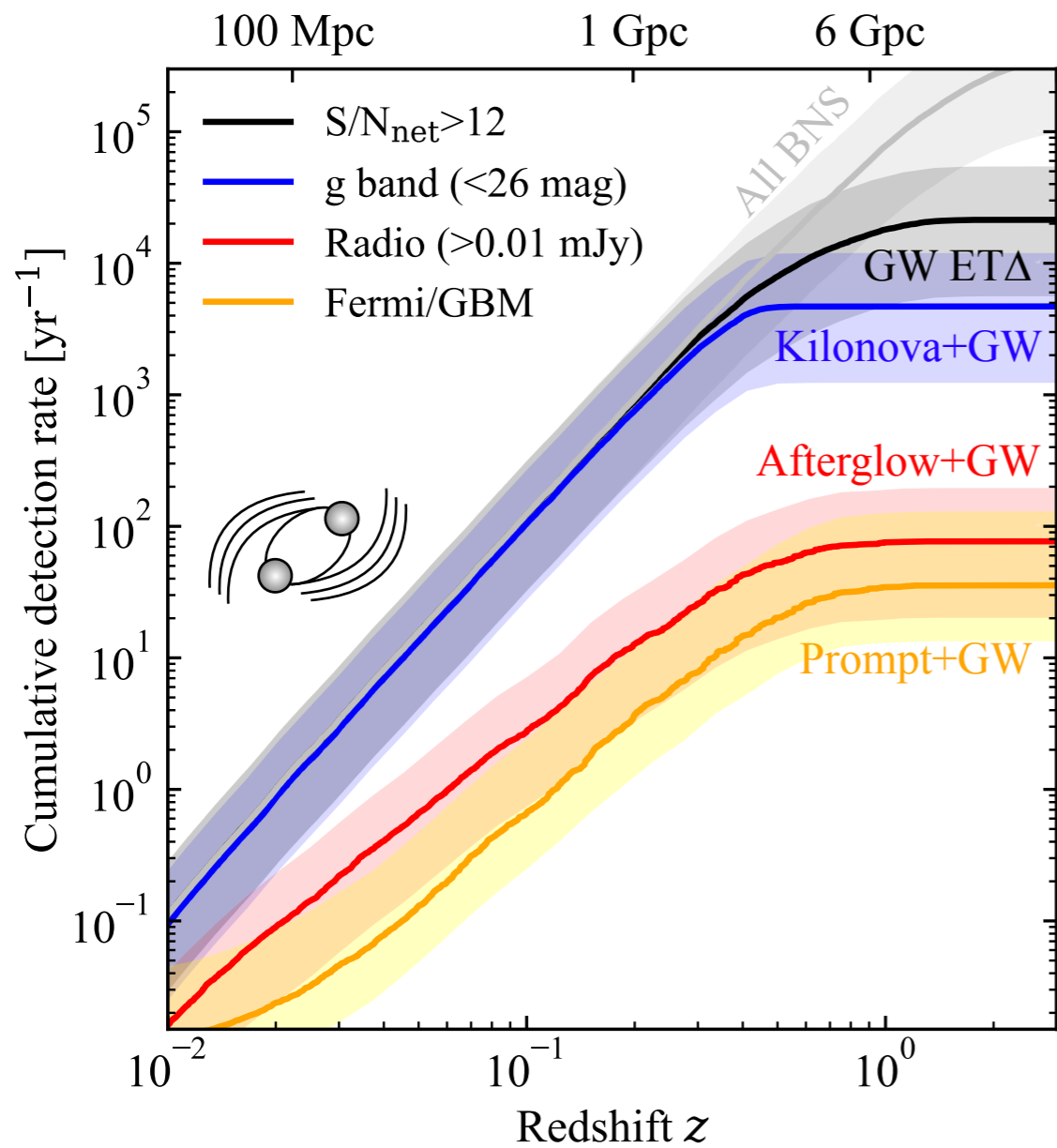
← The majority of short GRBs will have a GW counterpart!

See also Ronchini+22

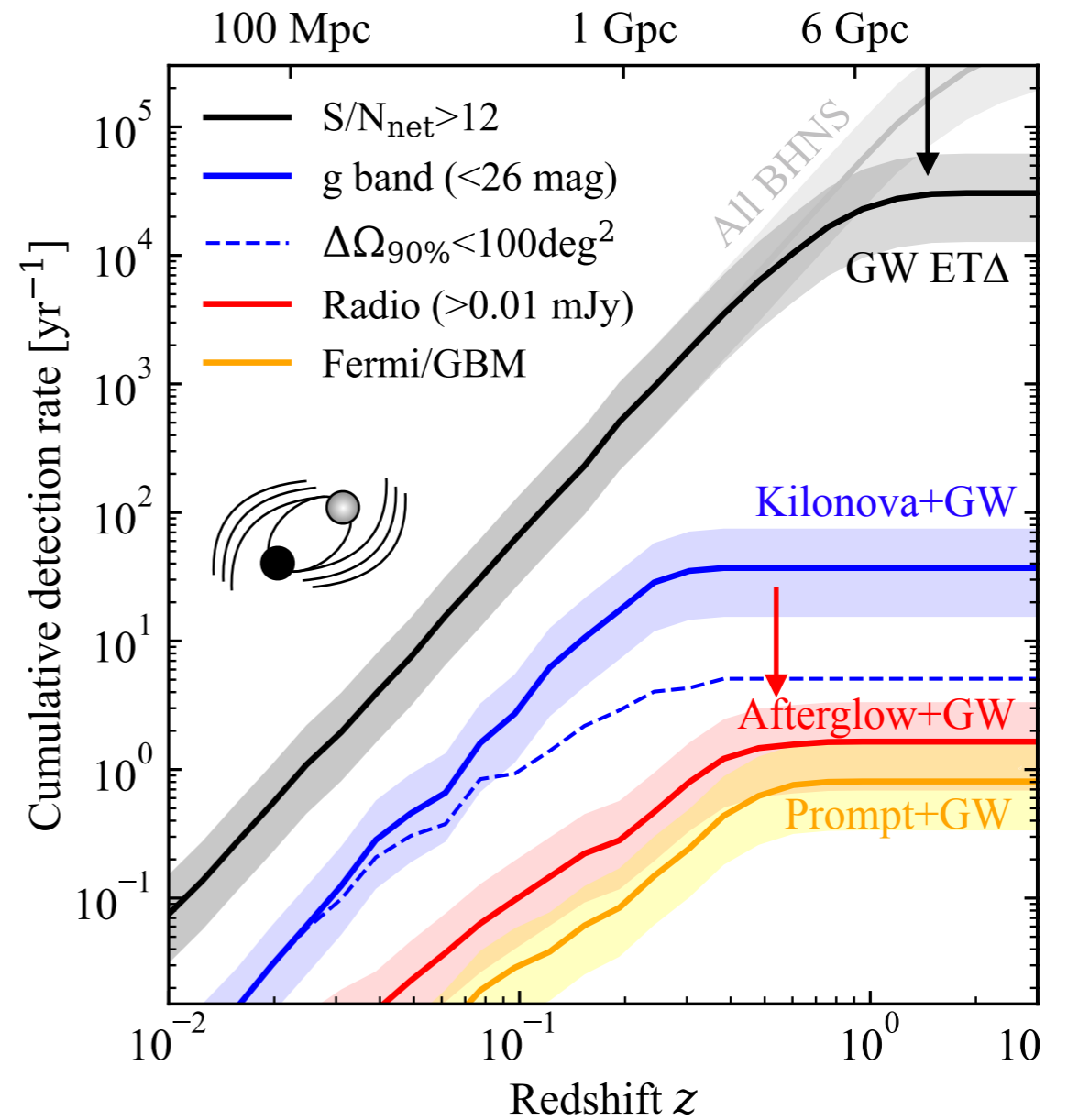
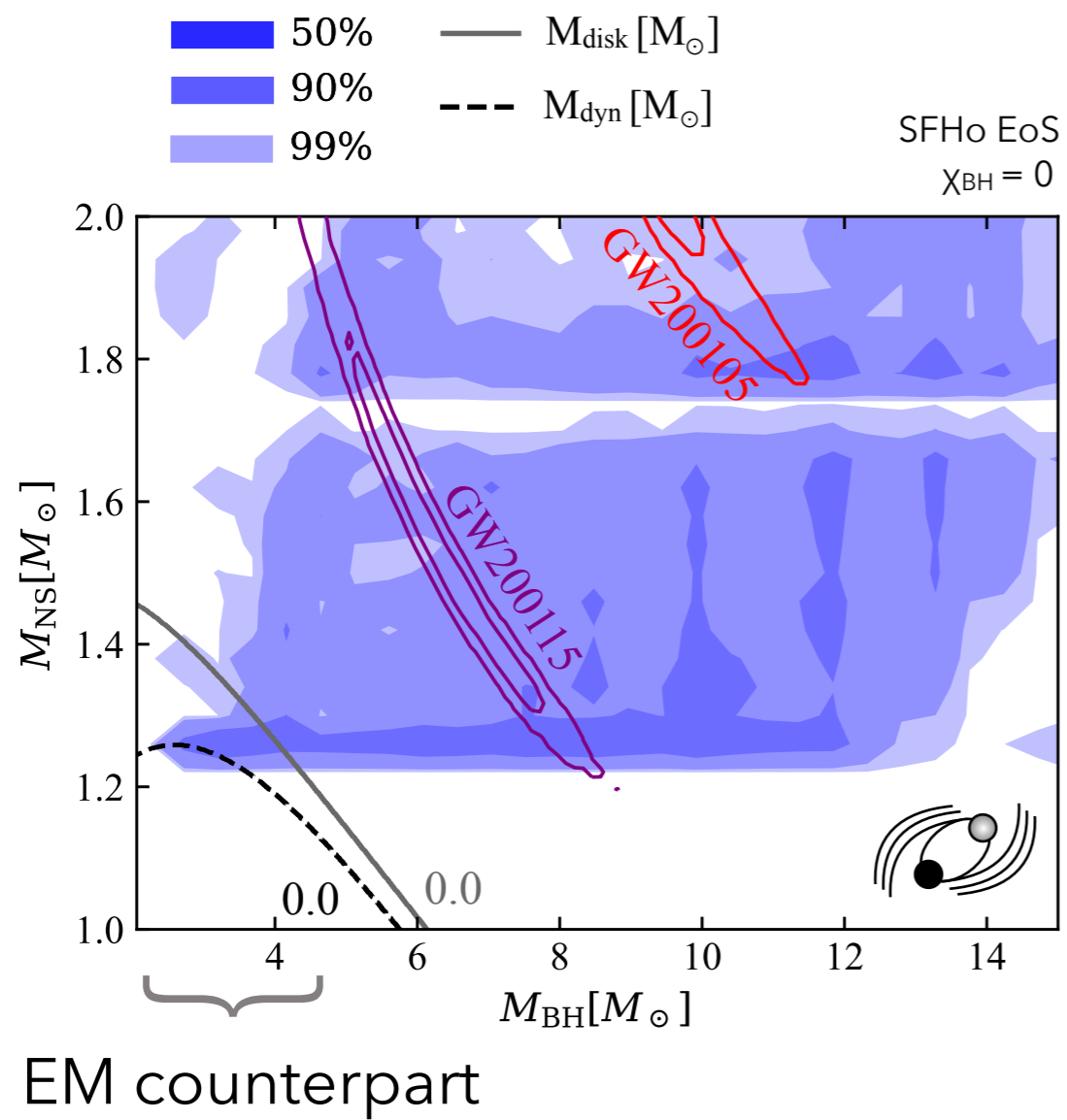
Multi-messenger observations with ET: BNS



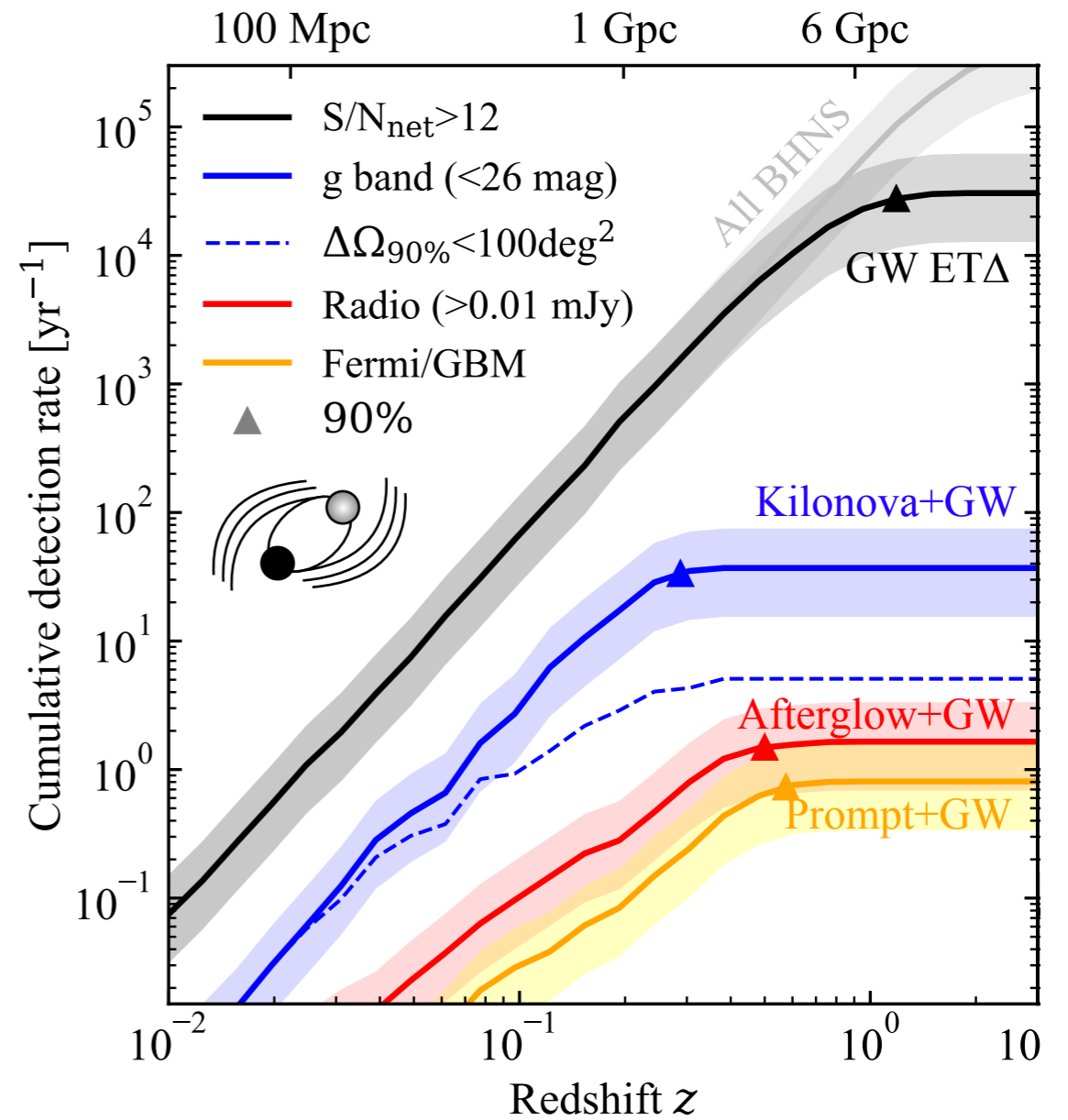
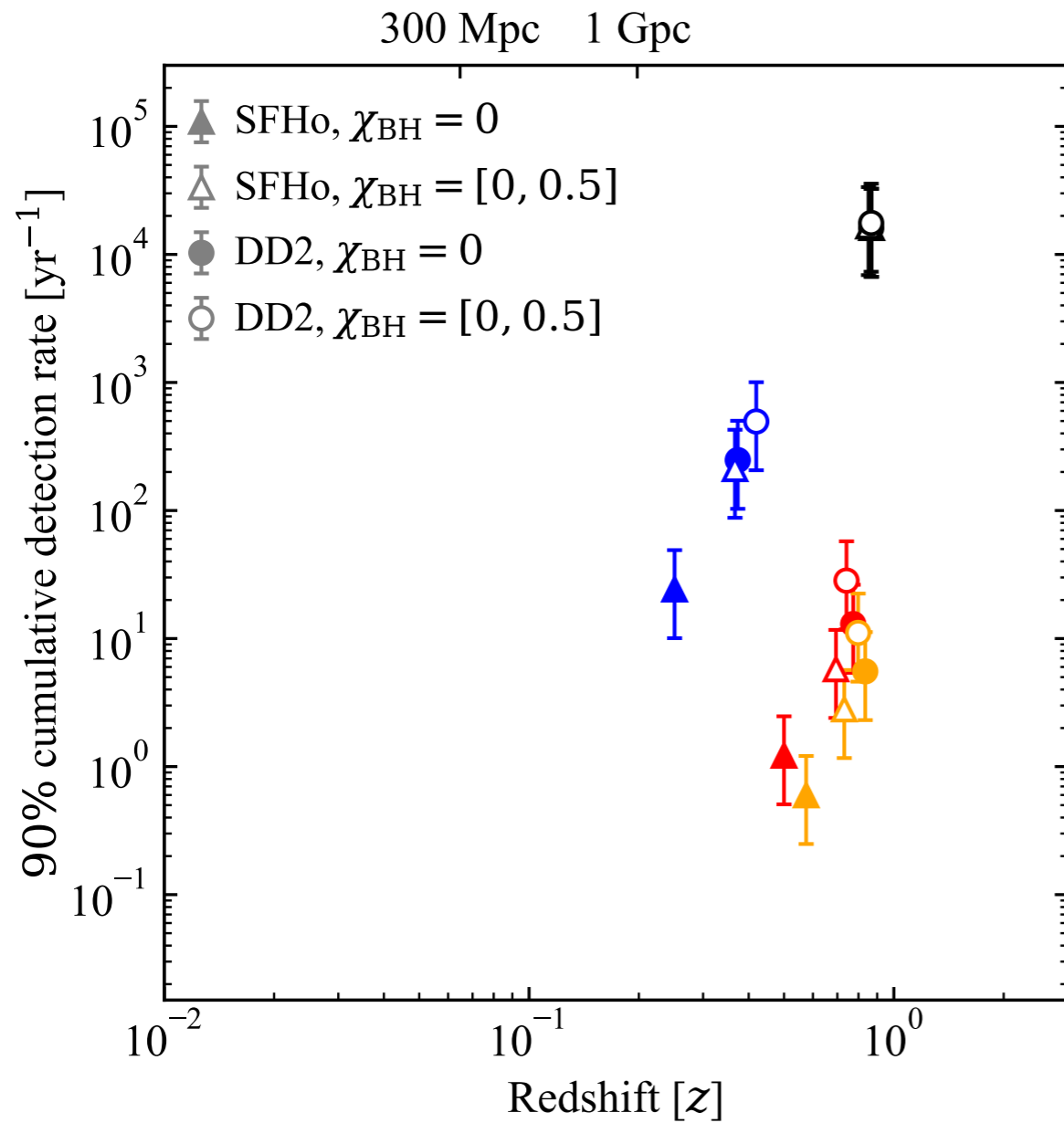
Multi-messenger observations with ET: BHNS



Multi-messenger observations with ET: BHNS



Multi-messenger observations with ET: BHNS



Conclusions

- ET will allow us to probe BNS and BHNS at **cosmological distances**
- Up to ~100 **KNe** detections per year for BNSs
- The majority of short **GRBs** will have a GW counterpart
- Strategies to **select GW events** are fundamental, in particular to increase the detections of EM counterparts from BHNSs
- Future high-energy instruments are fundamental to increase detections of **jet related emissions**
- Our model can be applied to **specific EM facilities**

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