

Multi-messenger session : Overview

Naturally it should be 'multi-messenger' !!

- Astronomical GW sources are in strong gravity field (or/and forming by itself), dense & compact objects.
 - > naturally High-Temperature !
- Electromagnetic (EM) emission, energetic particles are expected.**

Objects

- Transient : Compact binary coalescence, SNe, ...
- (semi- or quasi-)Stable : pulsar, LMBX, binary, ...
- Unknown sources

Counterpart ?

- Coincidence between GW signature and other observations
- External trigger of the event by certain observations

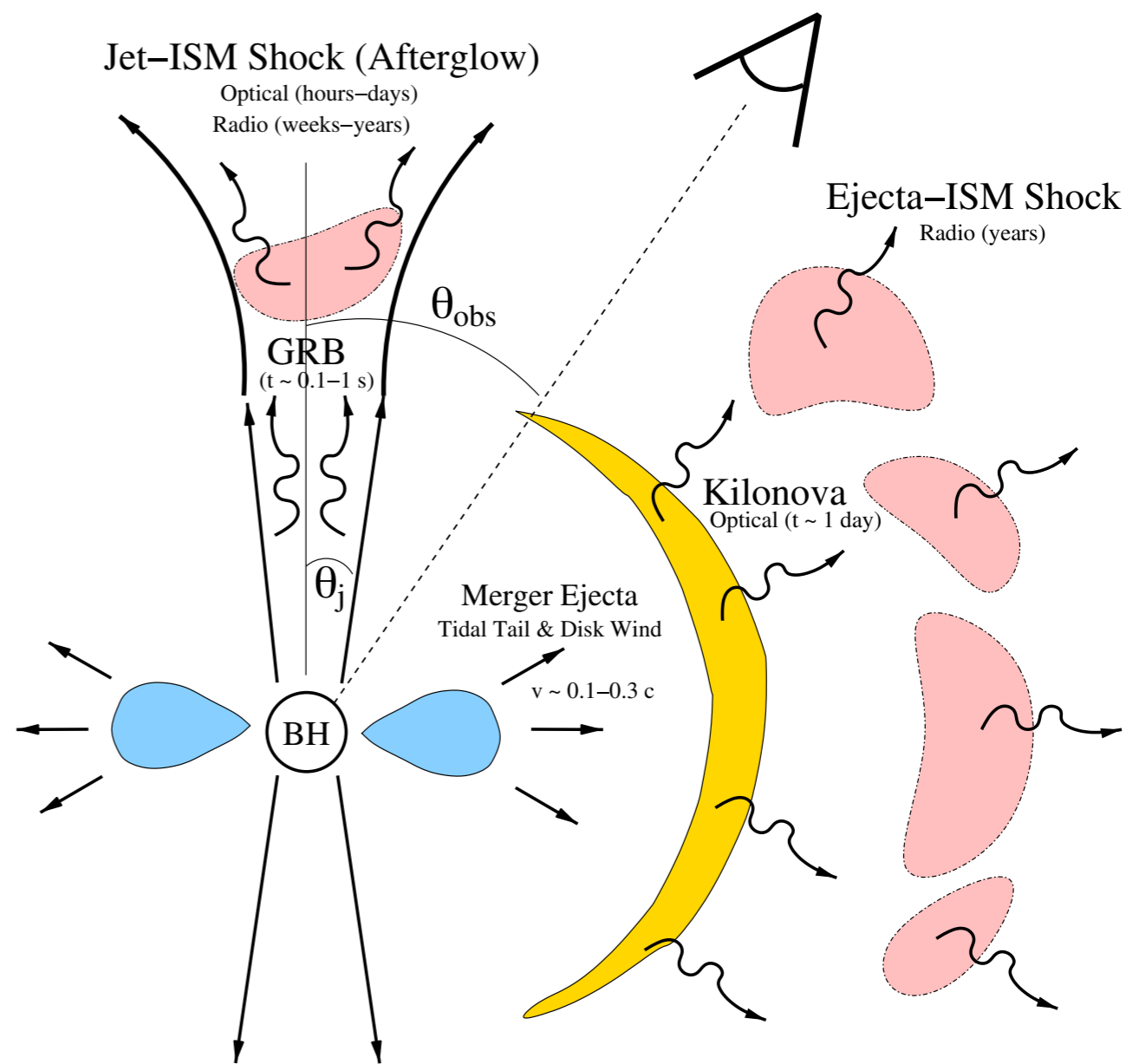
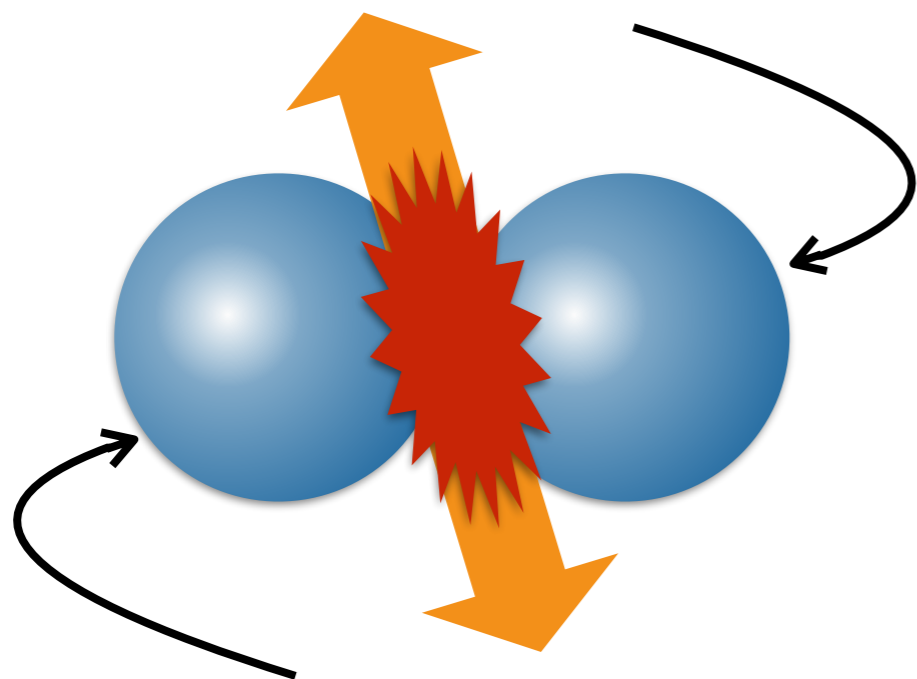
Follow-ups ?

- GW —> Obs.
- Obs. —> GW

e.g.: CBC might be a progenitor of ...

Short-GRB ? Macro/Kiro-Nova ?

- ==> Gamma, X, EM might be counterparts of GW detection.
- These are better angular resolution.
- Host galaxy identification $\rightarrow z$



Metzger & Berger, ApJ 746:48(2012)

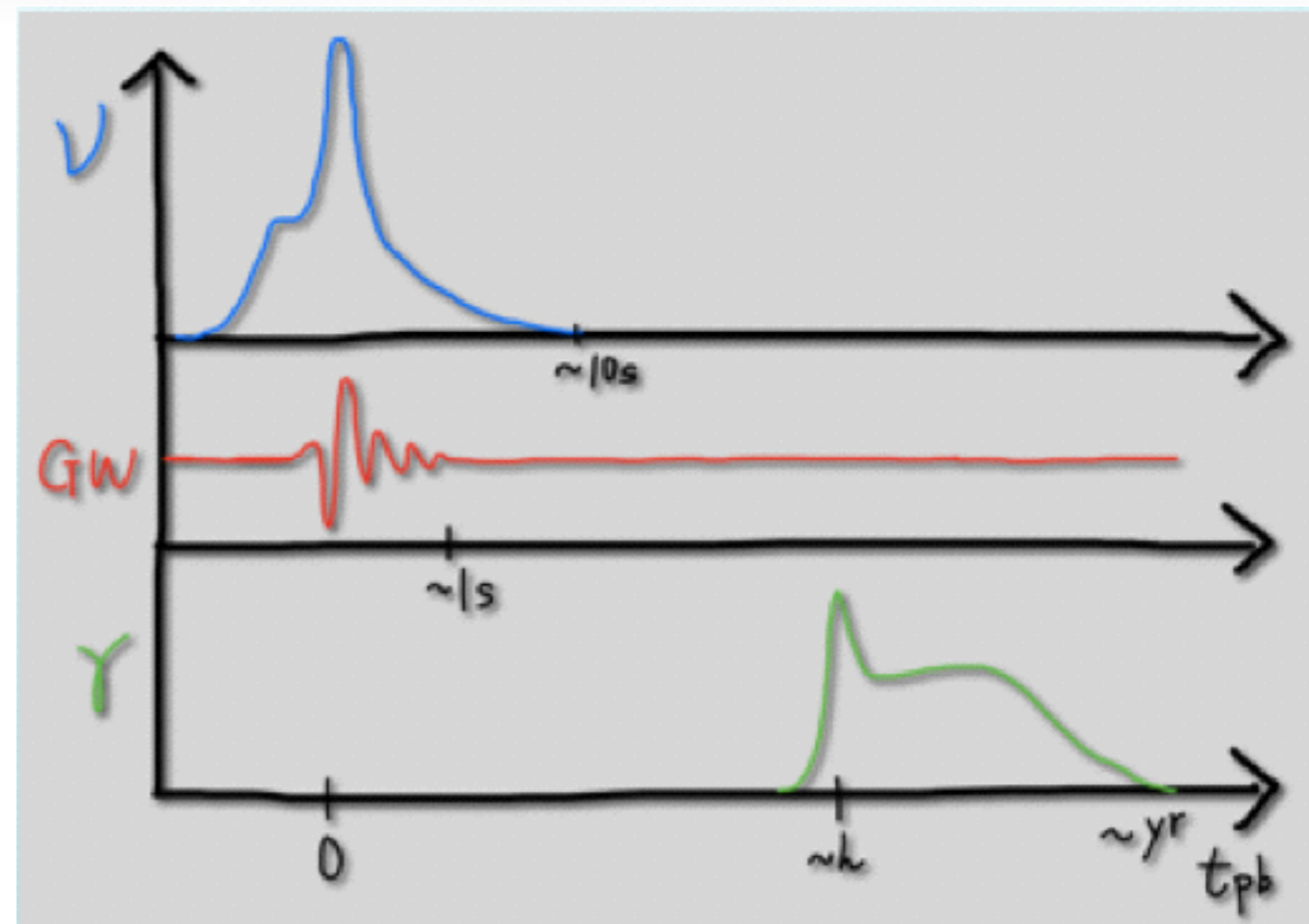
e.g: *Supernova*

Many process of SN possibly radiate GWs

- core bounce
- convection
- SASI
- Jet

Neutrino, GW, EM will be emitted.

- Fruitful scenario of 'coincidence detection'
- Multi-probes make it possible to get newer knowledge and deep understand of SN mechanism.



Drawn by Y.Suwa

e.g.: Supernova GW and neutrino

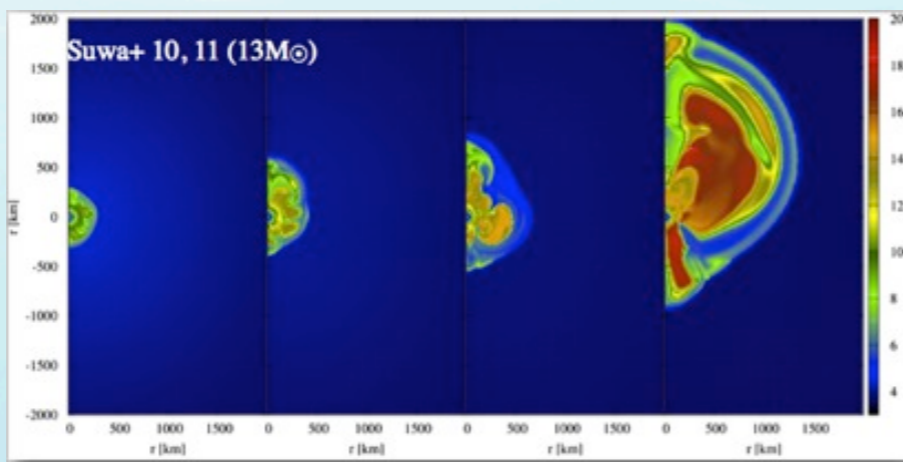
viewgraph by T.Yokozawa
Team SKE



SNe Theory(A05)

Y. Suwa

- Provide time correlated data, GW and neutrino
- Suggest signature signals physical phenomenon



Neutrino analysis(A03)

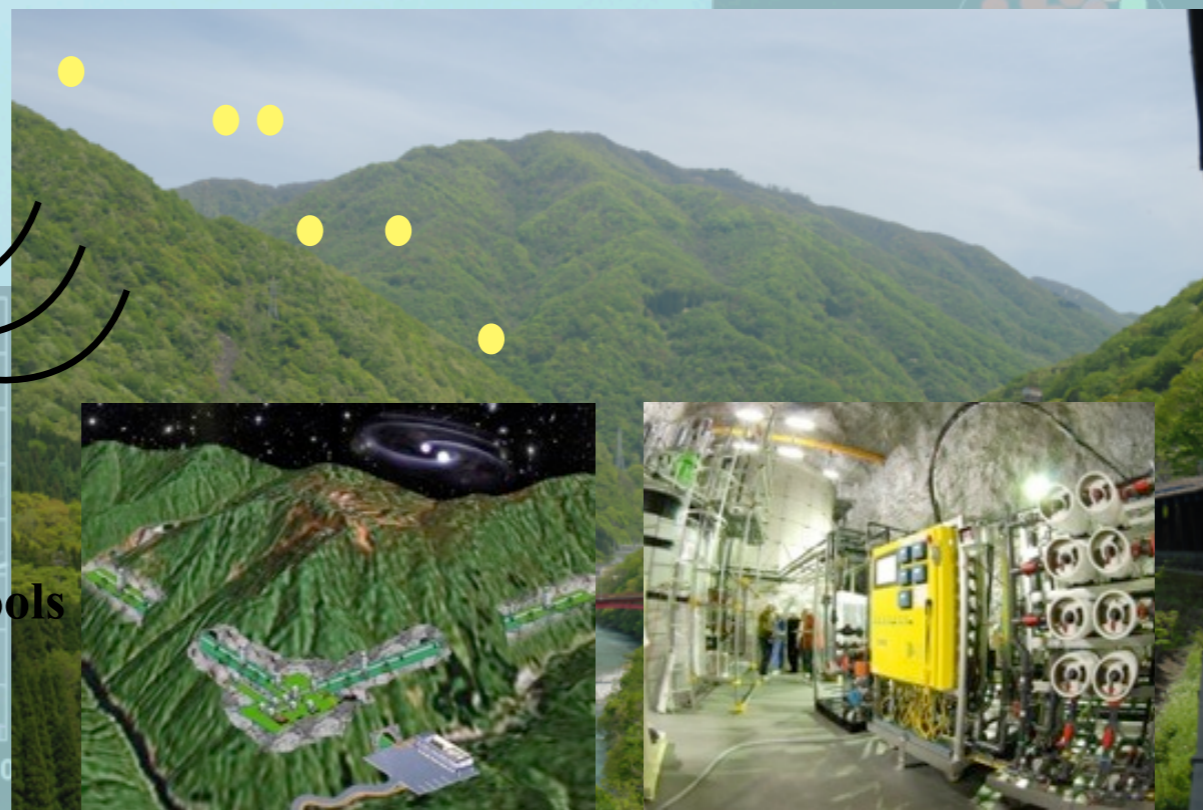
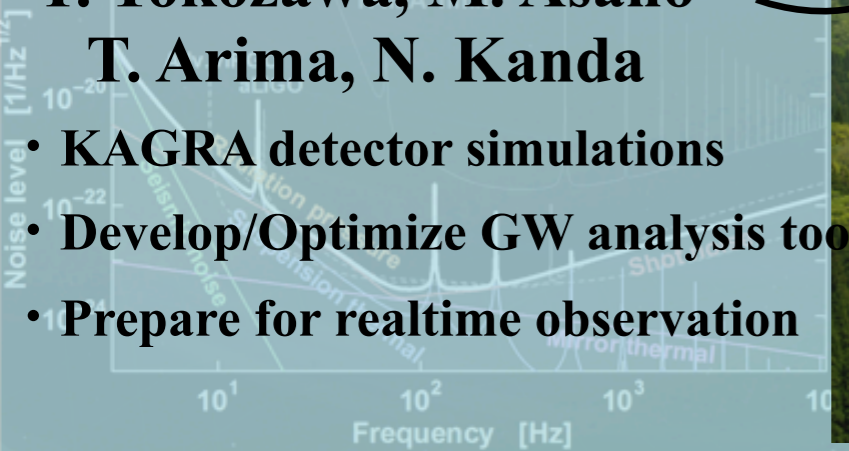
T. Kayano, Y. Koshio
M. Vagins

- R&D of EGADS detector
- Signal simulations with EGADS and SK

GW analysis(A04)

T. Yokozawa, M. Asano
T. Arima, N. Kanda

- KAGRA detector simulations
- Develop/Optimize GW analysis tools
- Prepare for realtime observation



e.g.: Supernova GW and neutrino

viewgraph by T.Yokozawa
Team SKE



SNe Theory(A05)

Y. Suwa

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Neutrino analysis(A03)

- Focus on **GW observed time**(t_{obs_gw}) and **Neutronization burst time**(t_{obs_nburst})
- Supernova detection simulation with KAGRA and EGADS detector

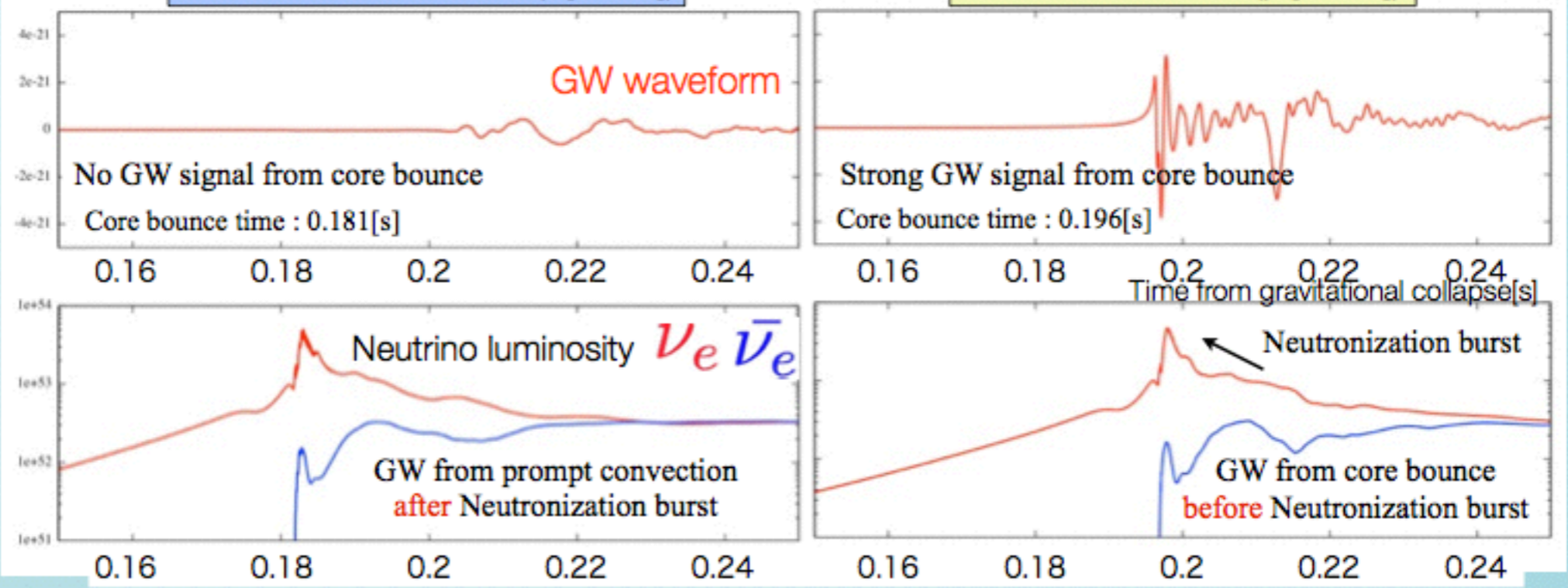
No core rotation
No GW signal from core bounce
GW from prompt convection **after** Neutronization burst



Strong core rotation
Strong GW signal from core bounce
GW from core bounce **before** Neutronization burst

No core rotation case (0[rad/s])

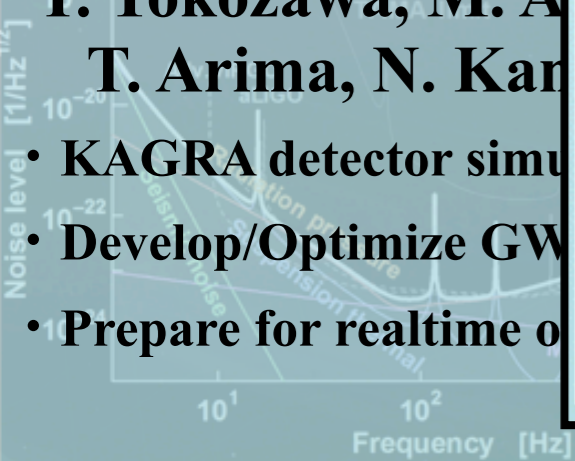
core rotation case(pi[rad/s])



GW analysis(A04)

T. Yokozawa, M. A. T. Arima, N. Kar

- KAGRA detector simu
- Develop/Optimize GW
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GW and EM Counterparts / Followups got Grant Support in Japan !



“New development in astrophysics through multimessenger observations of gravitational wave sources”

Grant-in-Aid for Scientific Research on Innovative Areas by MEXT, Japan

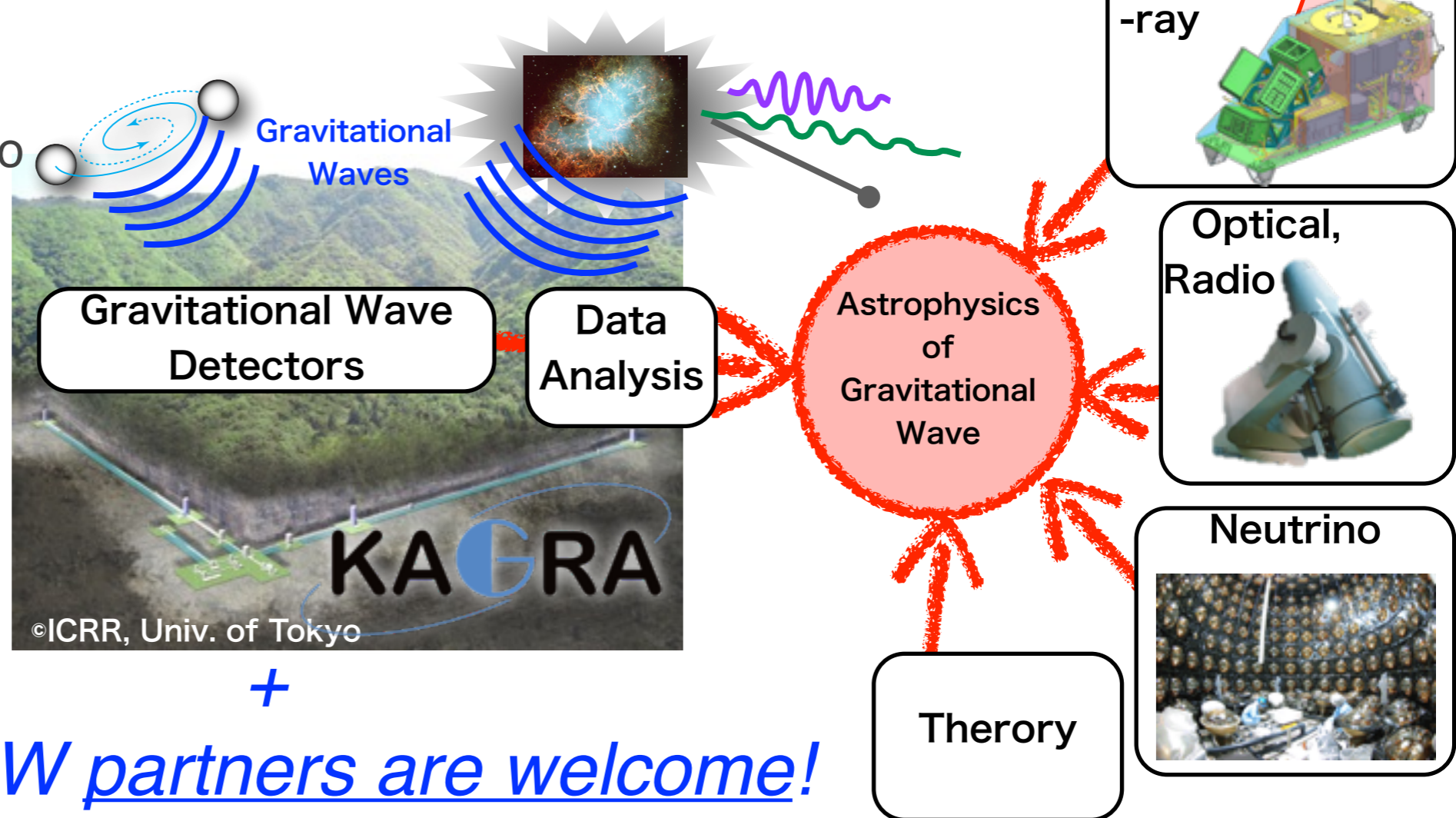
Head : Takashi Nakamura

Term of Project : Fiscal year 2012-2016 (until end of March 2017)

Budget : ~800 milion yen (~7.7 USD)

Consists of five groups :

- 1) X & Gamma Ray
- 2) Optical & Infrared & Radio
- 3) Neutrino
- 4) GW data analysis
- 5) Theory



global GW partners are welcome!

Look neighbors and open future doors !