O3 Sky Localization Calculation Comparison between MCMC and Fisher Analysis

Yuta Michimura

Department of Physics, University of Tokyo

Network Configuration and Source

- Network sensitivity
  aLIGO: Late Low (116 Mpc) LIGO-P1200087
  AdV: Mid Low (63 Mpc) LIGO-P1200087
  KAGRA: O3-40 (42 Mpc) JGW-T1707556

- Source parameters (GW170817-like)
  masses: 1.5-1.24 Msun
  redshift: z= 0.009 (~40 Mpc)
  inclination angle: 30 deg
  polarization angle: 0 deg
  no spins

- Source locations (192 locations)
  see Haino-san's list: dst-3102.txt

Calculation Method Comparison

- S. Haino (see [JGW-G1807674](#), [JGW-G1808042](#))
  Nested sampling with MCMC
  TaylorF2

- Y. Michimura et al.
  Fisher analysis
 PhenomD ([PRD 93 044007 (2016)](#)) ONLY INSPIRAL

1σ Sky Localization Comparison

Sky localization error comparison (O3, GW170817-like)
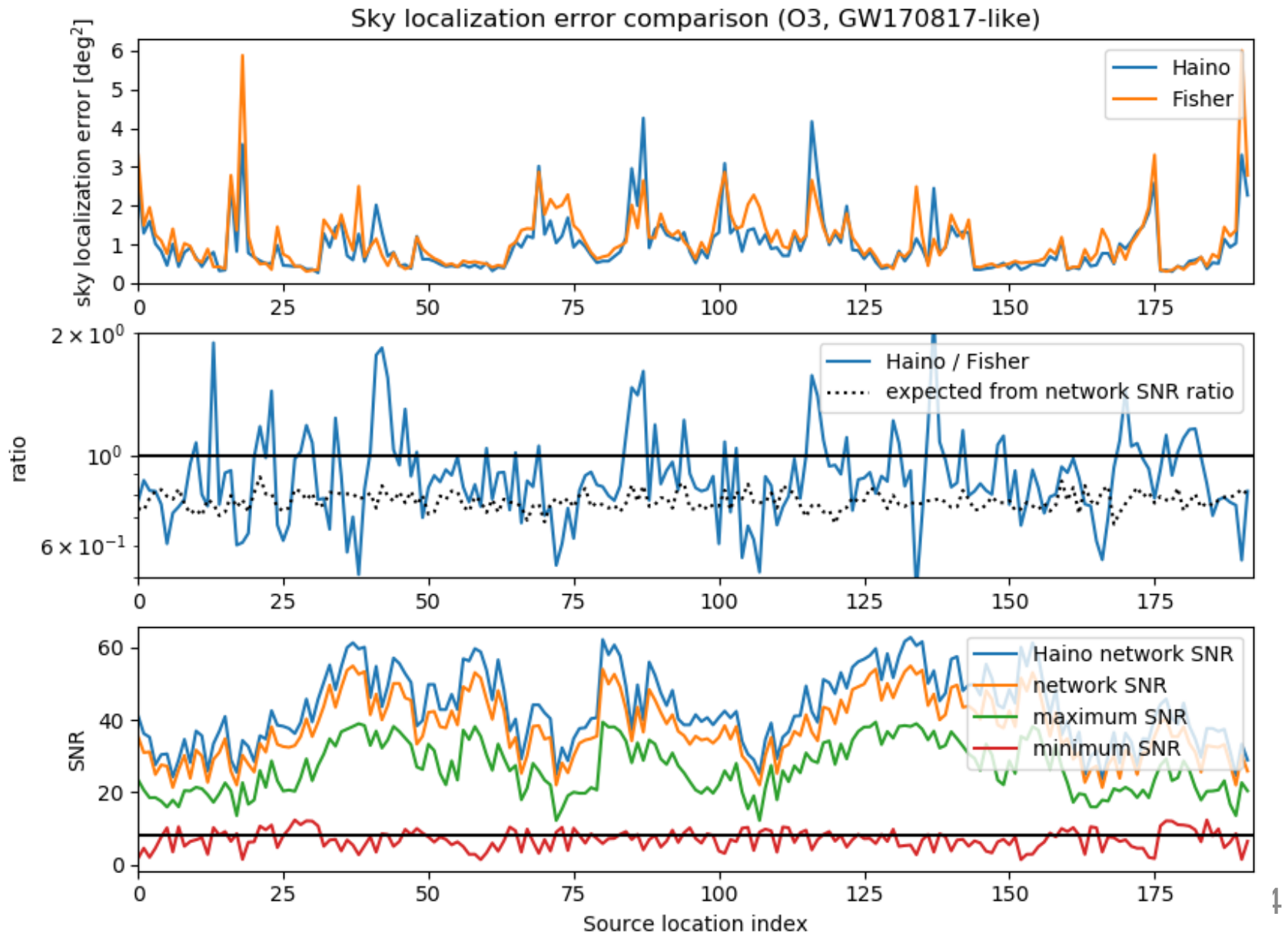
1σ Sky Localization Comparison

- Agreed within x2

- Haino-san's result is 9 +/- 2 % smaller than Fisher result

- Network SNRs by Haino-san is 12 +/- 2 % higher (probably because YM+ uses only inspiral waveform) and this should give 22 +/- 4 % difference in the sky localization error
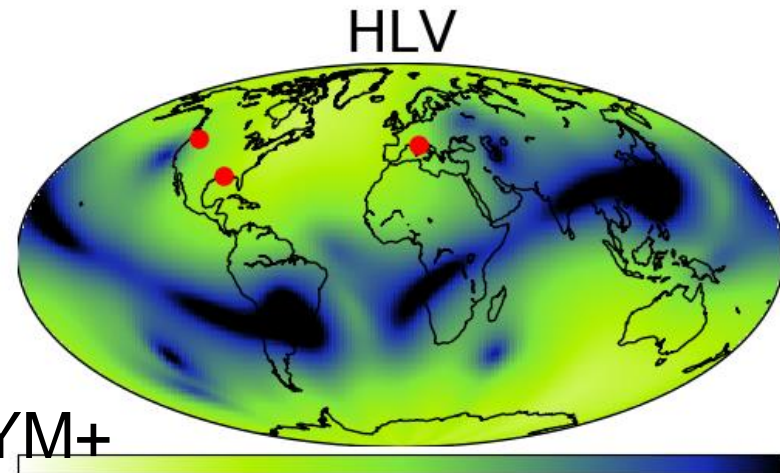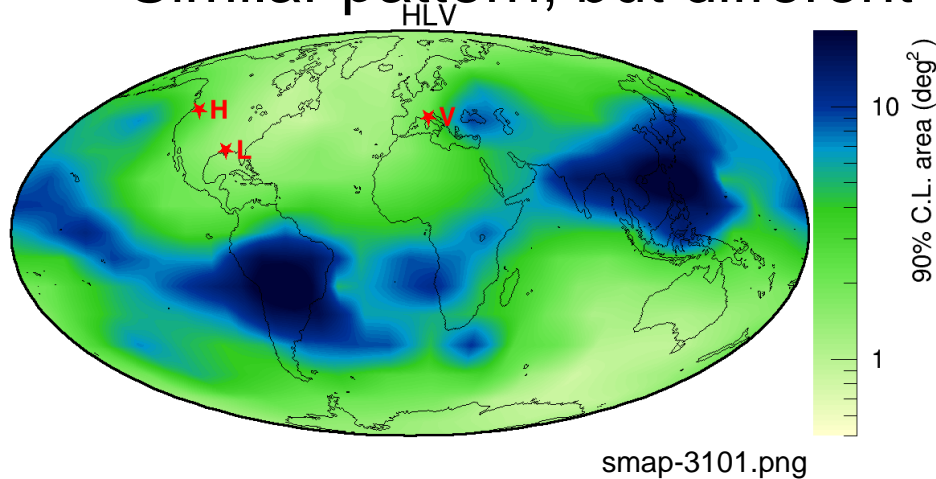
- Sounds reasonable
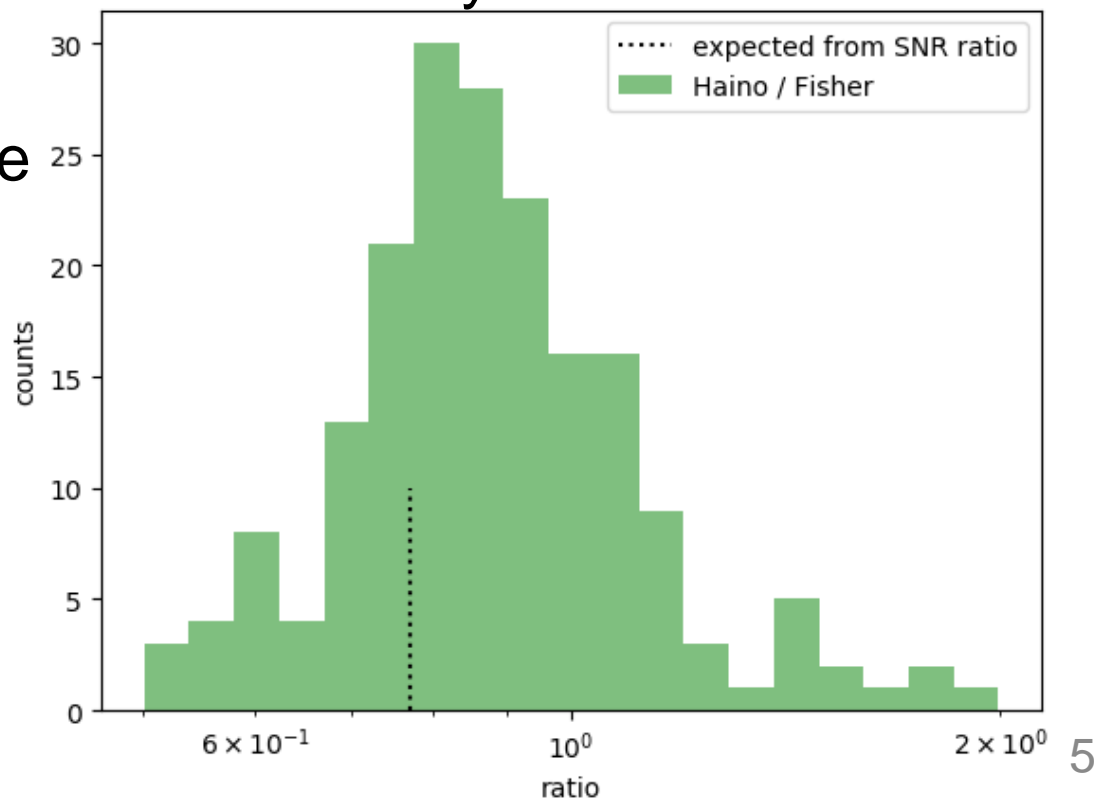
Discussion

- Fisher analysis assumes that SNR is high enough
- But there seems no correlation between SNR and sky localization error difference
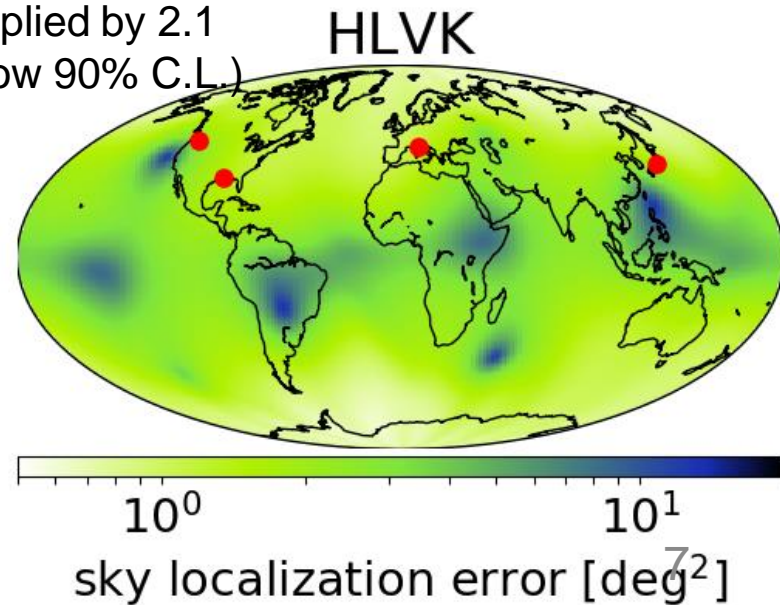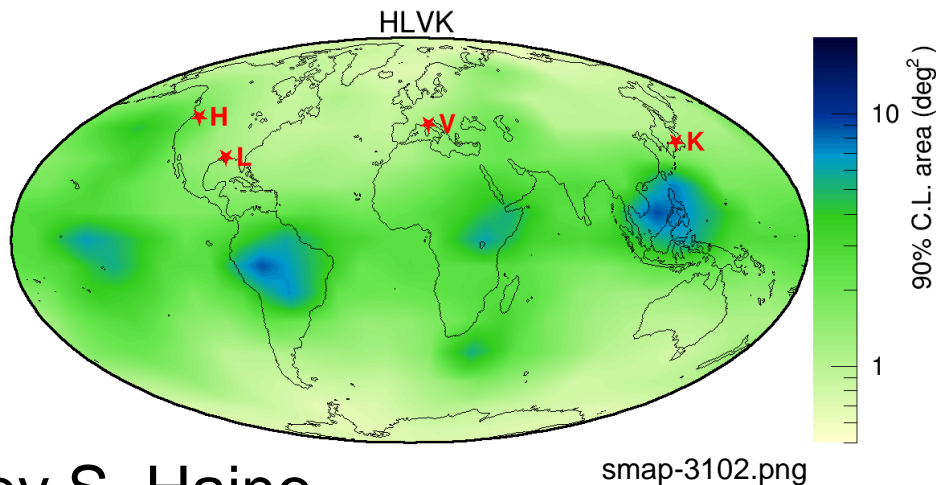- Still under investigation
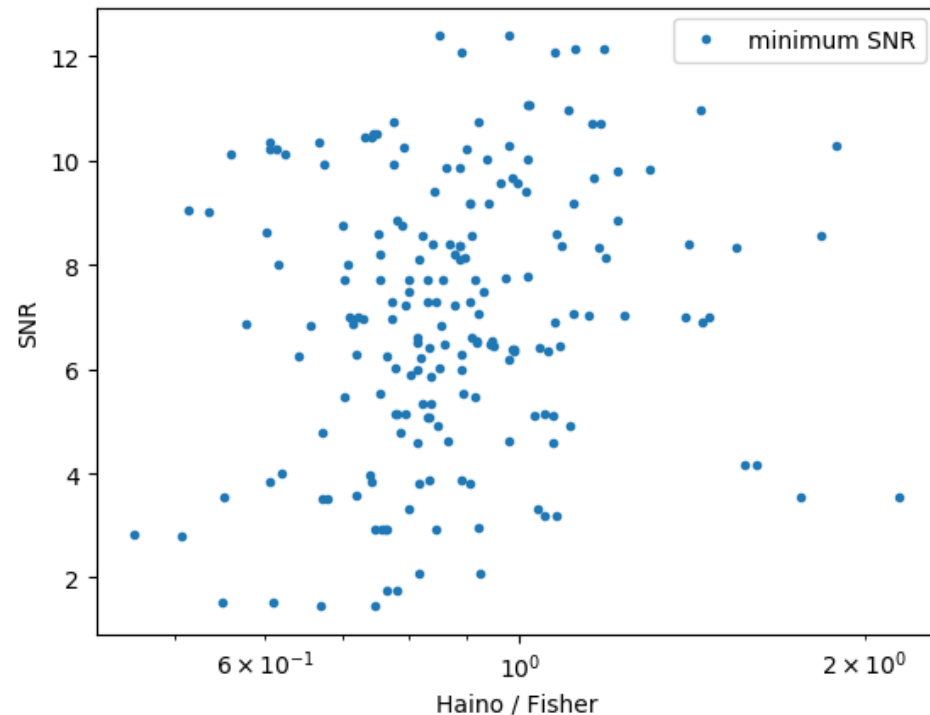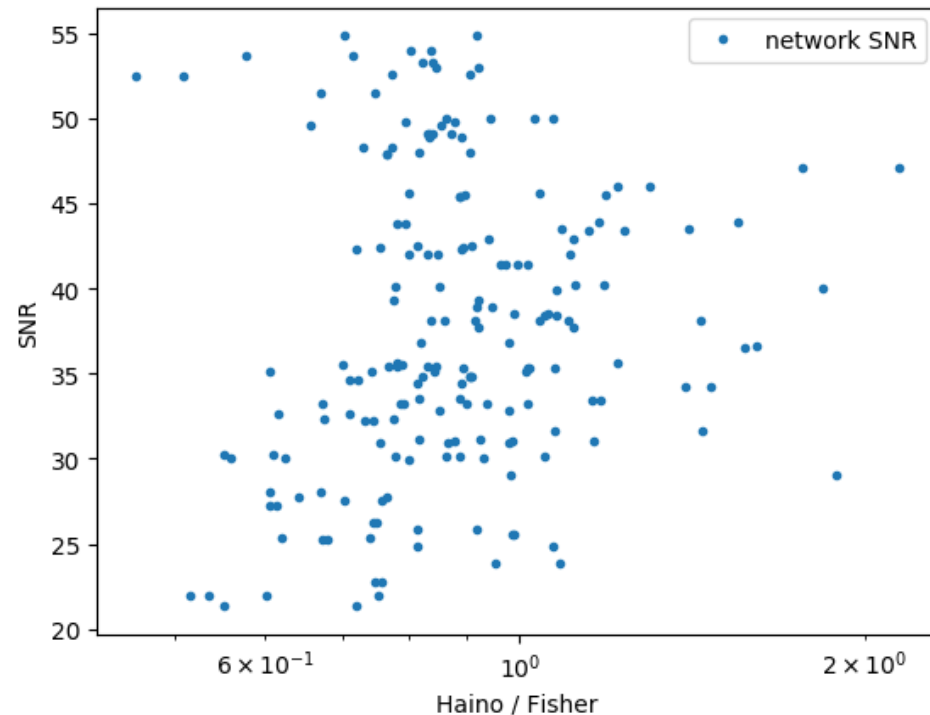
Map Comparison

- NOTE that color bars are not exactly the same!
- Similar pattern, but different

HLV

smap-3101.png

HLVK

smap-3102.png

HLV

by YM+
(multiplied by 2.1
to show 90% C.L.)

HLVK

sky localization error [deg^2]

by S. Haino
(http://www.icrr.u-tokyo.ac.jp/~haino/gsim/gsim.html)

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