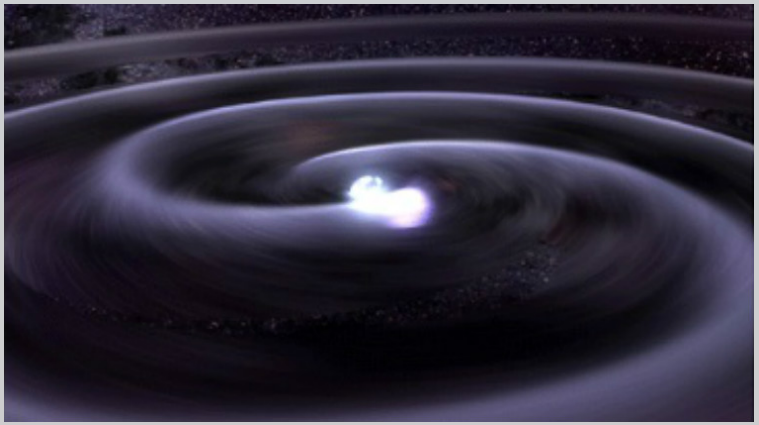
A simultaneous search for prompt radio emission associated with sGRBs using the all-sky OVRO-LWA

Marin M Anderson
Caltech

URSI National Radio Science Meeting
January 11, 2019

Short, bright pulse of prompt radio emission associated with compact object mergers?



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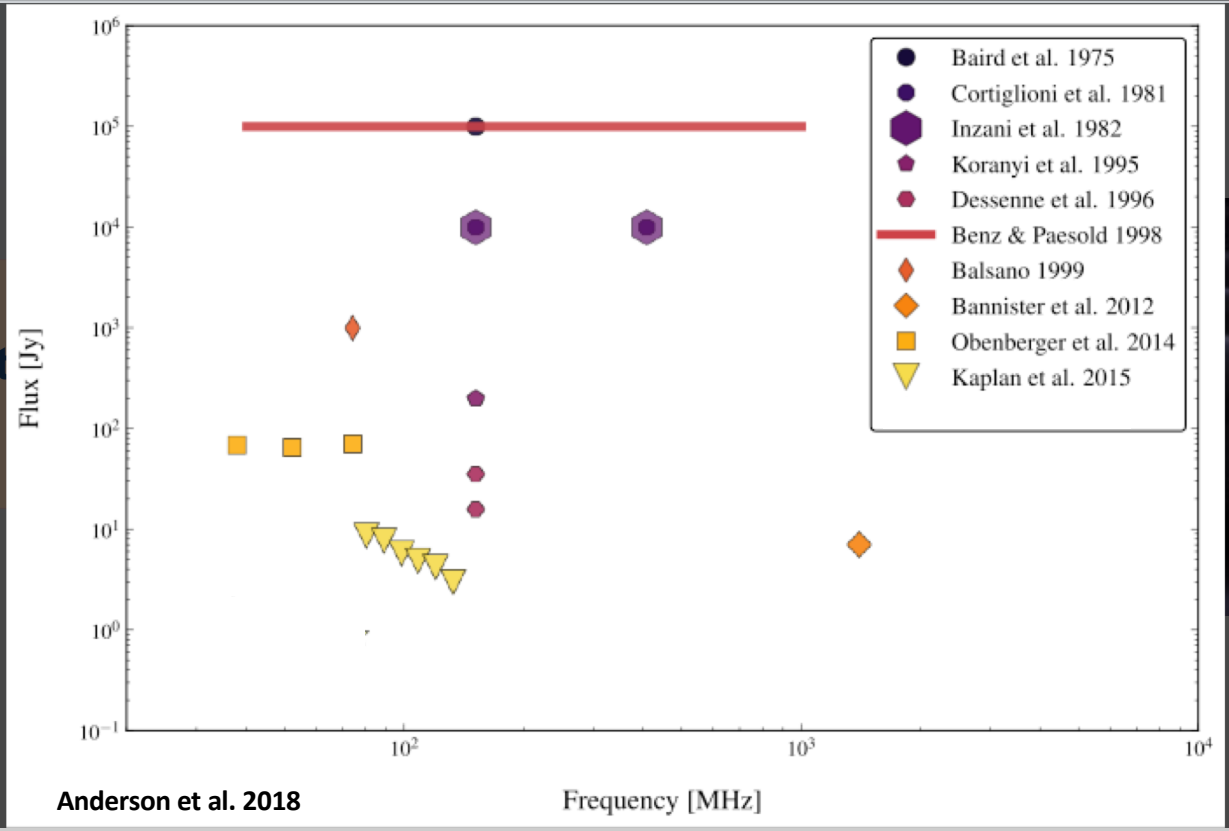
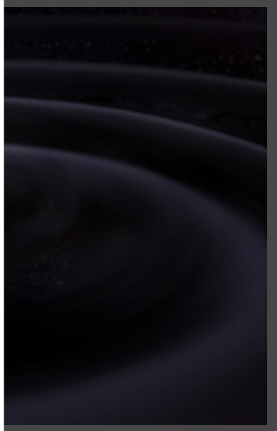
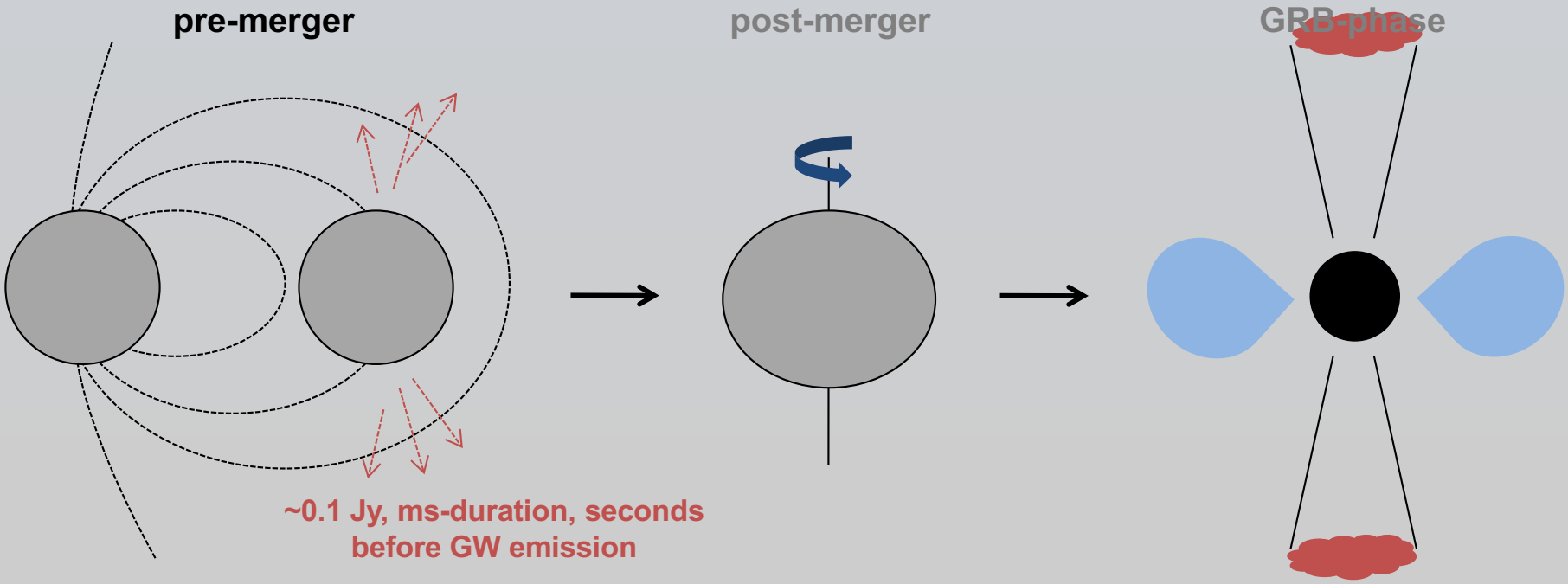
Prompt pulse?



Anderson et al. 2018



A number of models predict a (highly speculative) counterpart to SGRBs and NS-NS mergers in the form of prompt, low frequency radio emission.



e.g. Hansen & Lyutikov 2001
Lyutikov 2019 ~days prior to merger!

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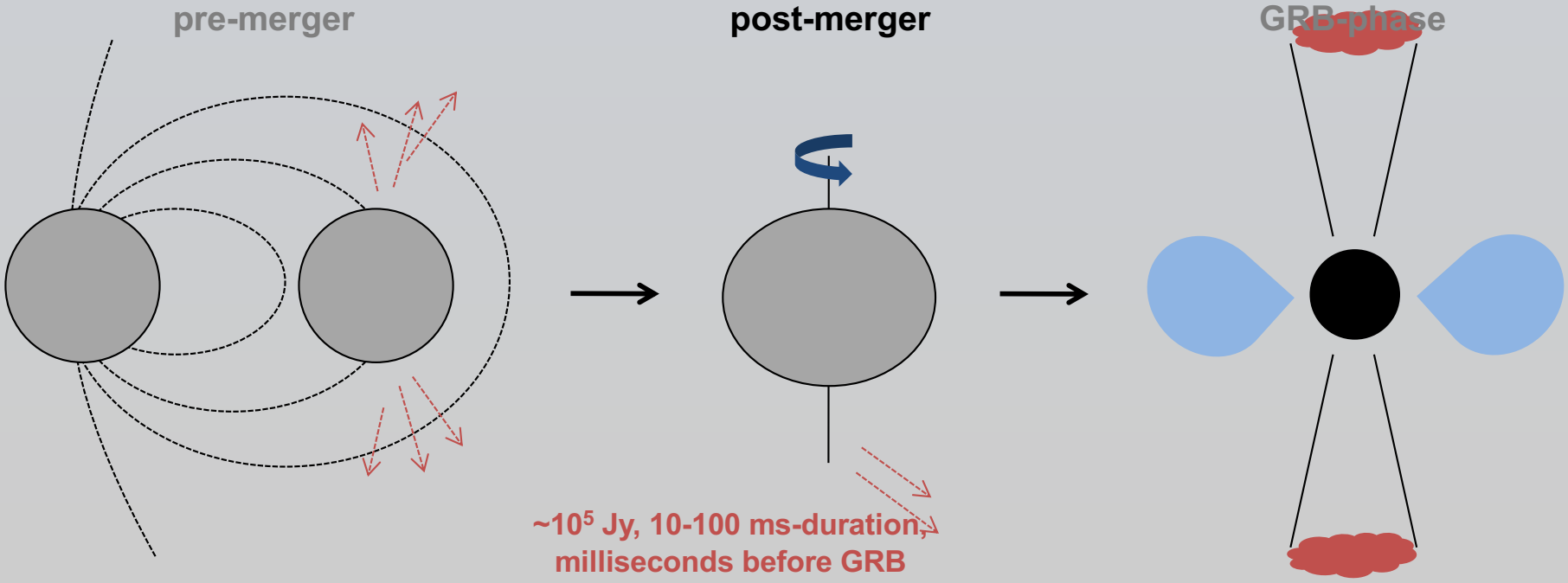

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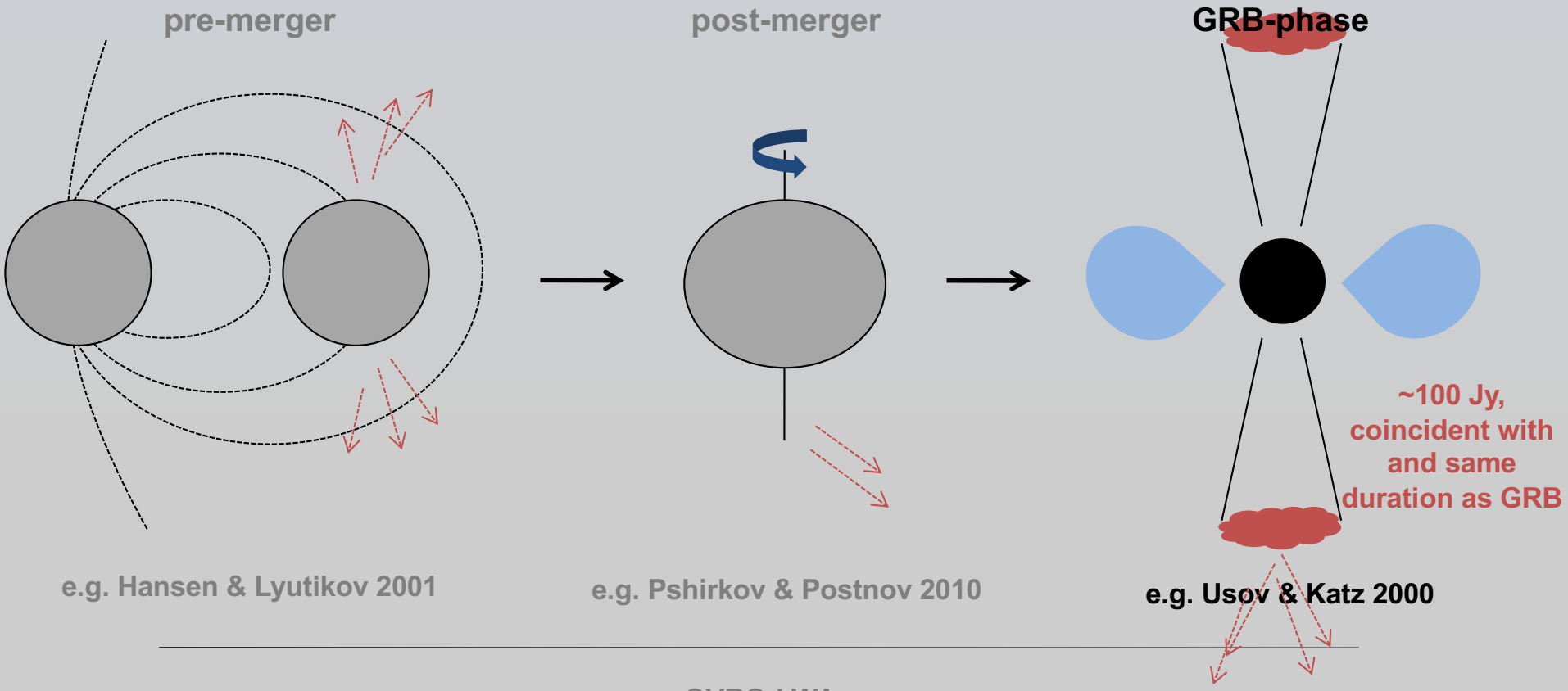

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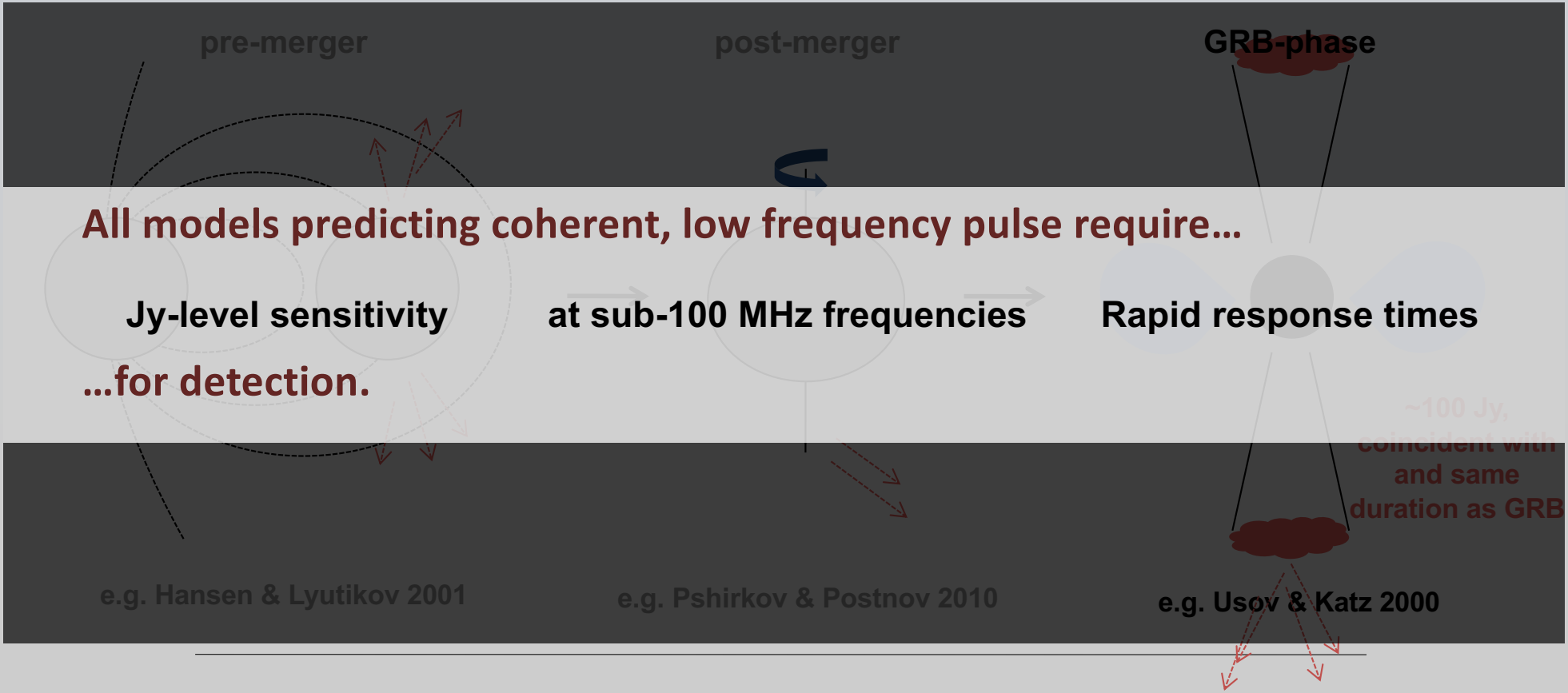
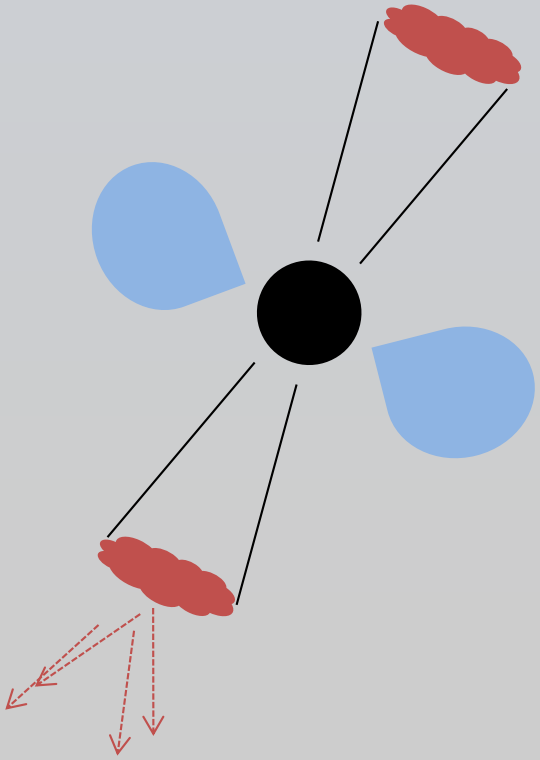


All models predicting coherent, low frequency pulse require…

Jy-level sensitivity → **at sub-100 MHz frequencies** → **Rapid response times**

…for detection.

Why is prompt pulse of low frequency radio emission accompanying GRB valuable?

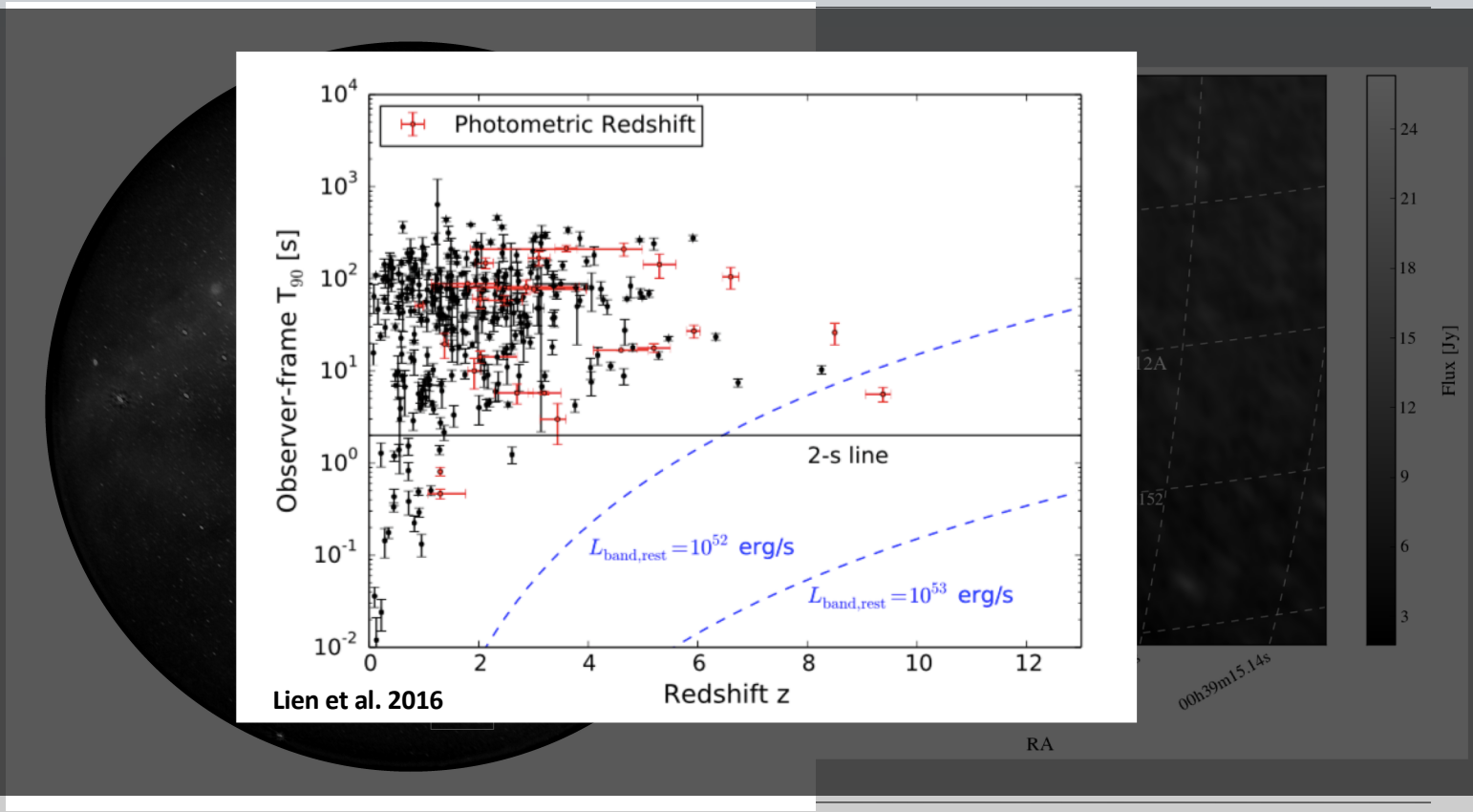


Serves as probe of **IGM density and turbulence**.

Provides constraints on explosion physics in GRBs, including **Lorentz factor** and **jet opening angle**.

Provides **EM-counterpart** to **GW source**!

Deepest search for prompt, coherent emission associated with sGRB 170112A with the OVRO-LWA.



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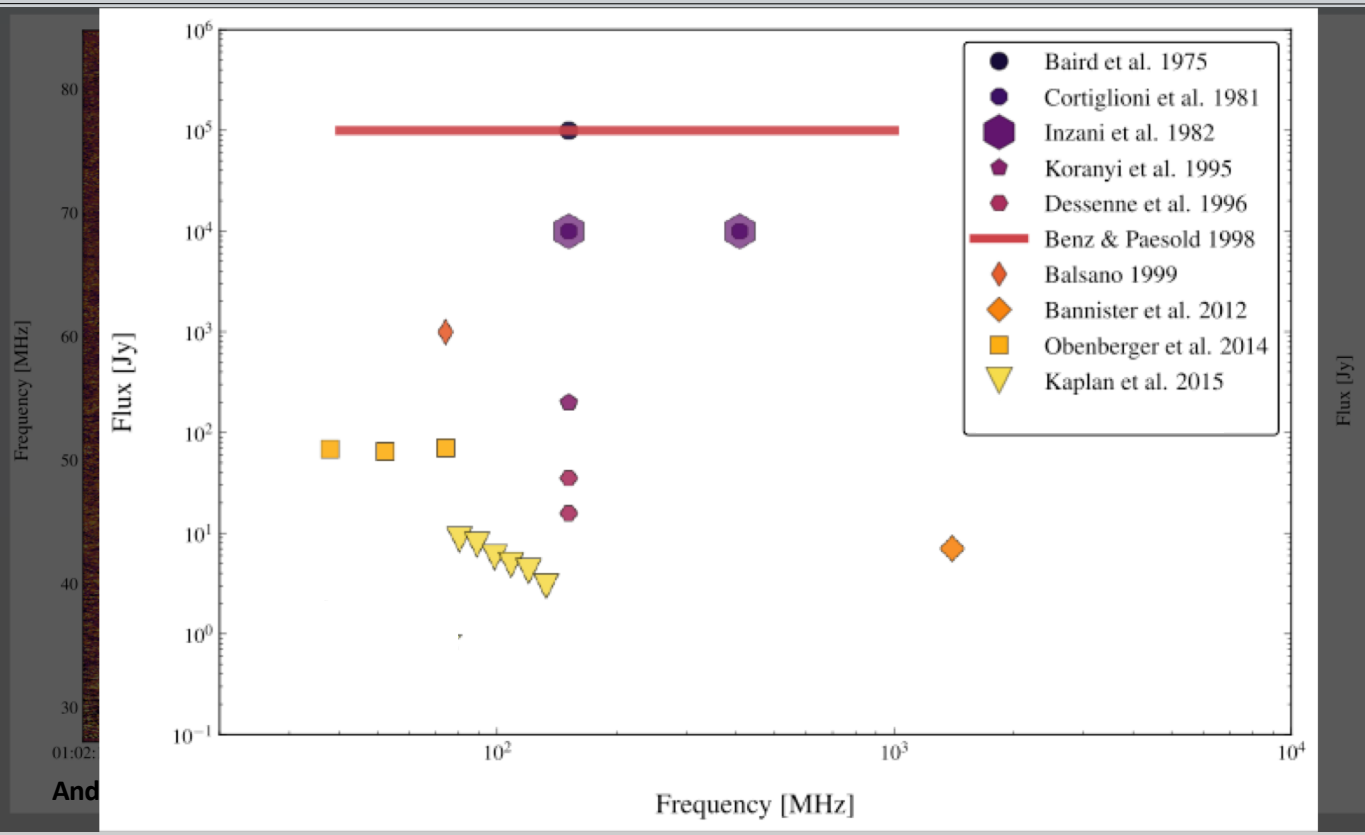
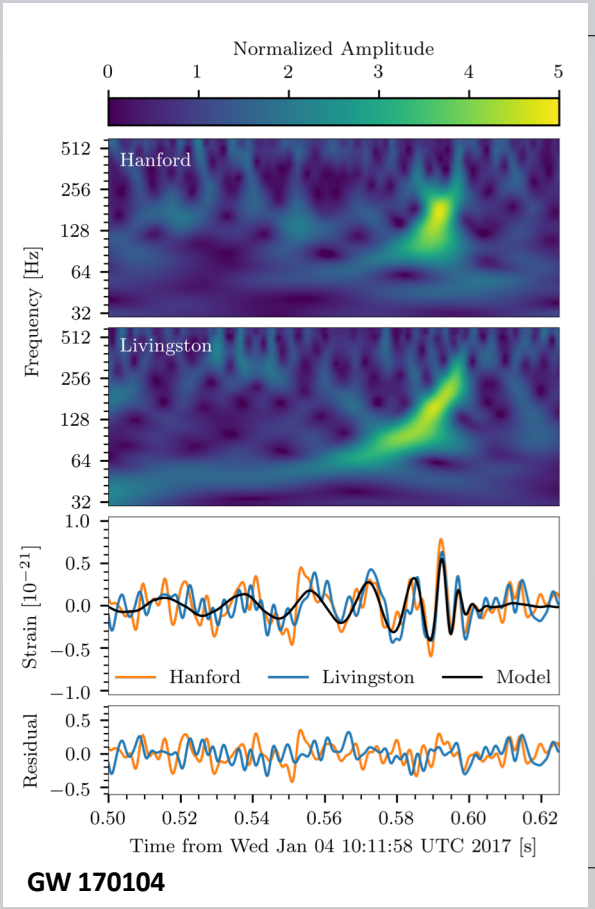
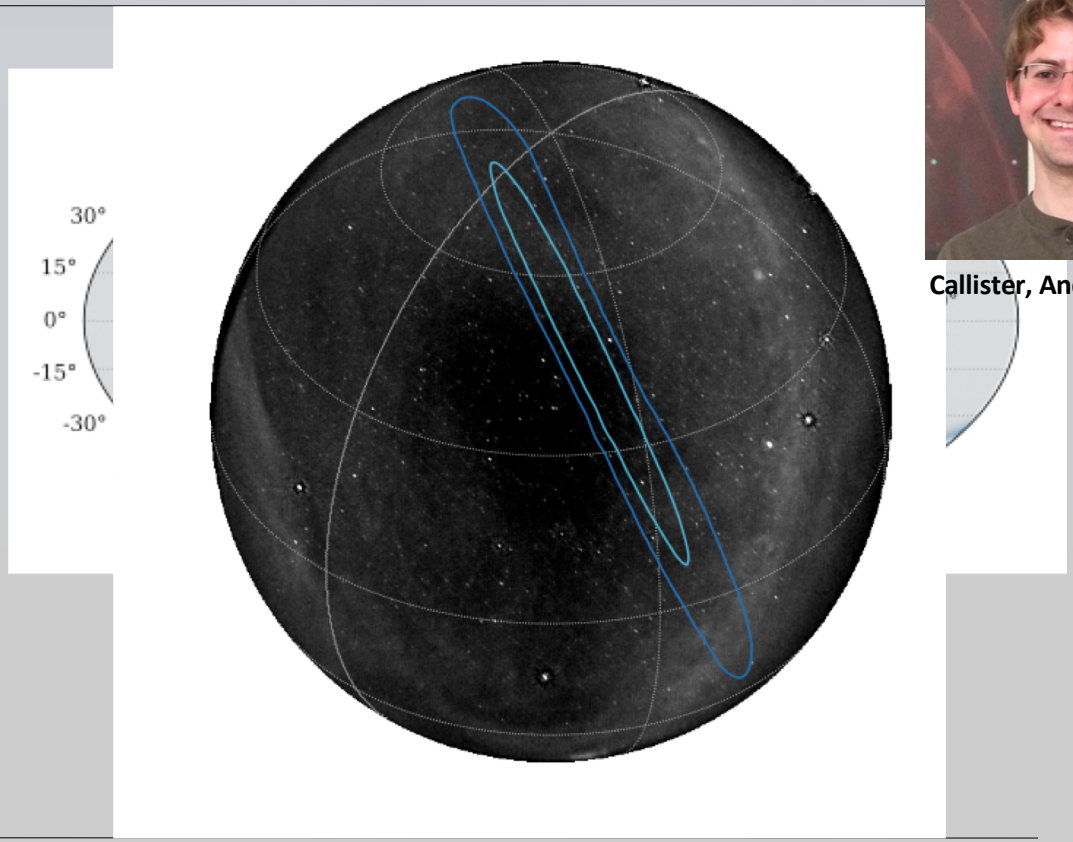
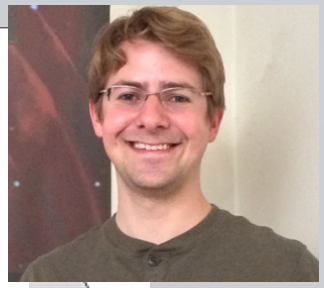


Using the OVRO-LWA to search for events coincident with LIGO triggers!



GW 170104





Callister, Anderson et al. 2019

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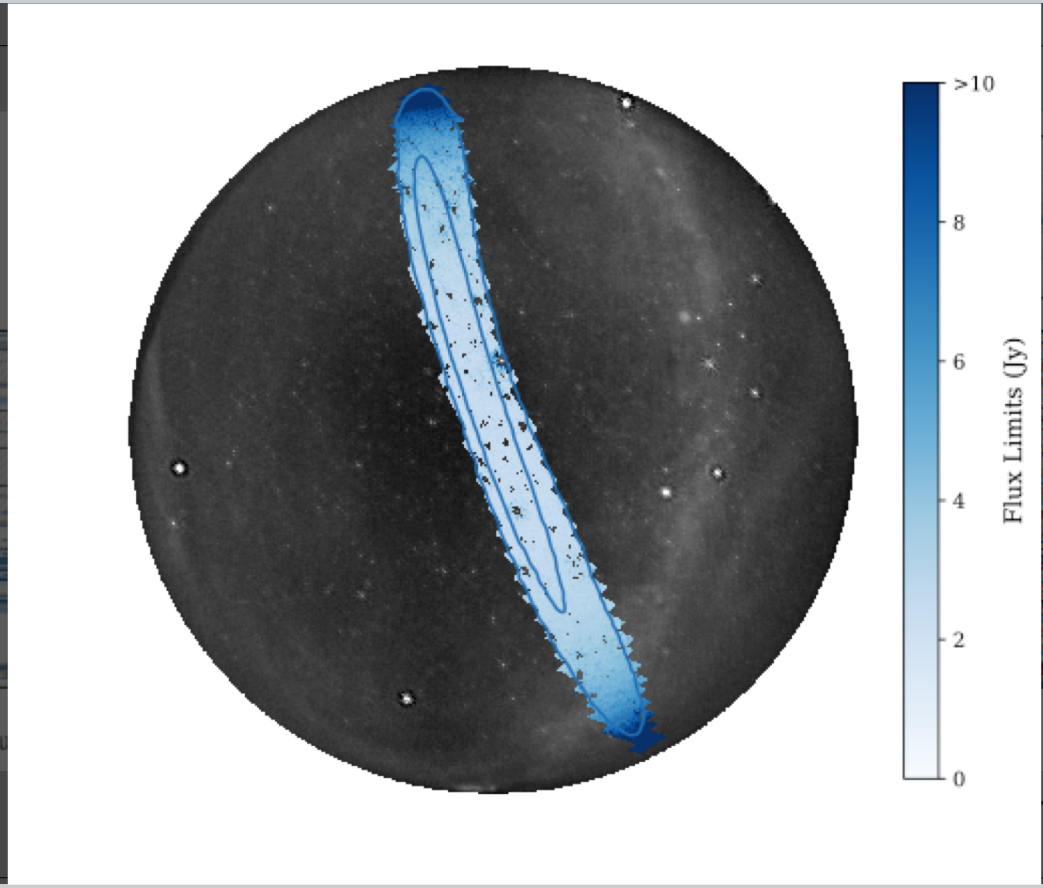

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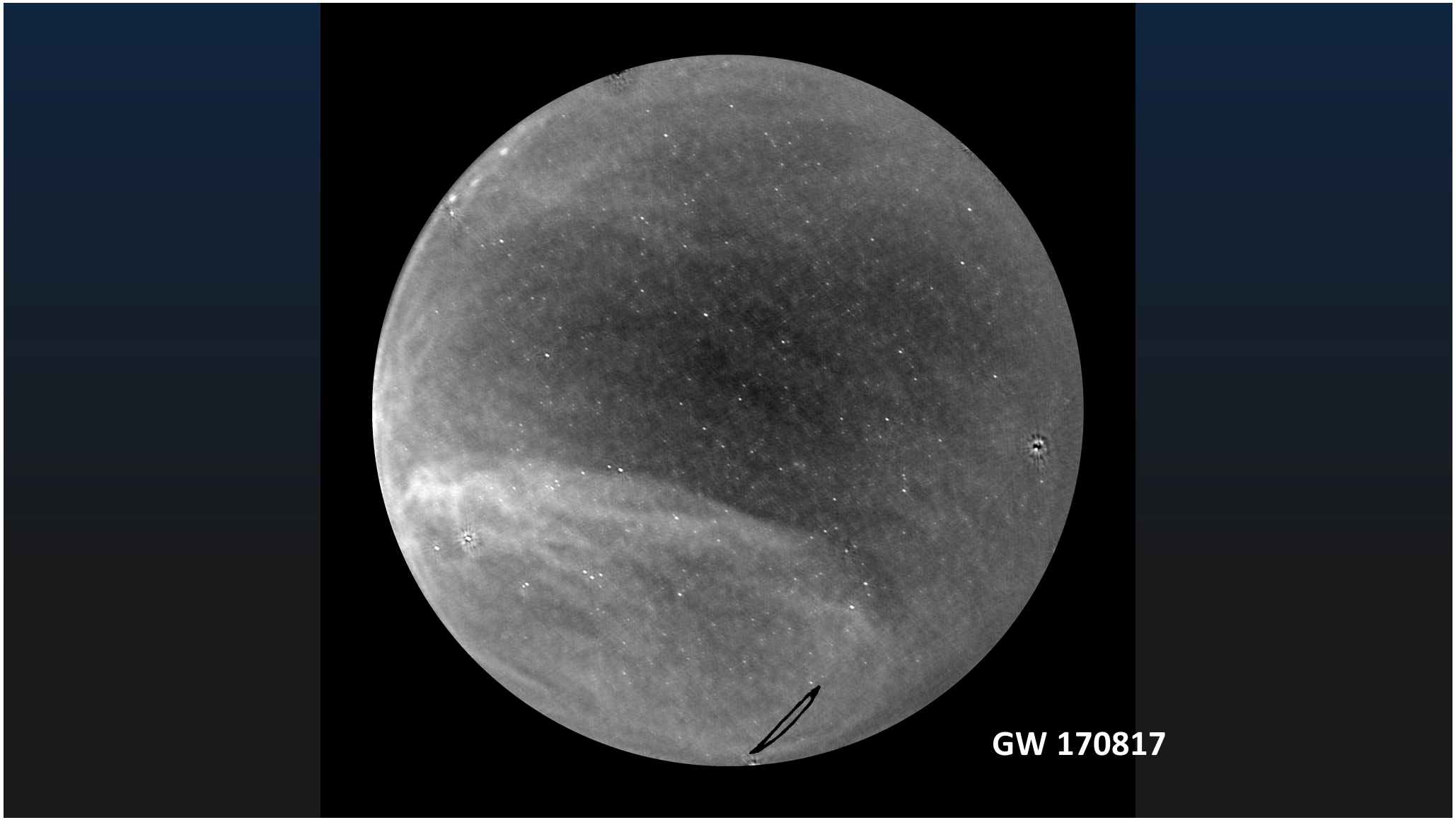

GW 170817

Summary

Prompt radio emission from NS-NS mergers

Prompt, coherent, short-duration burst predicted to accompany NS-NS mergers / SGRBs, brightest at low frequencies.

OVRO-LWA

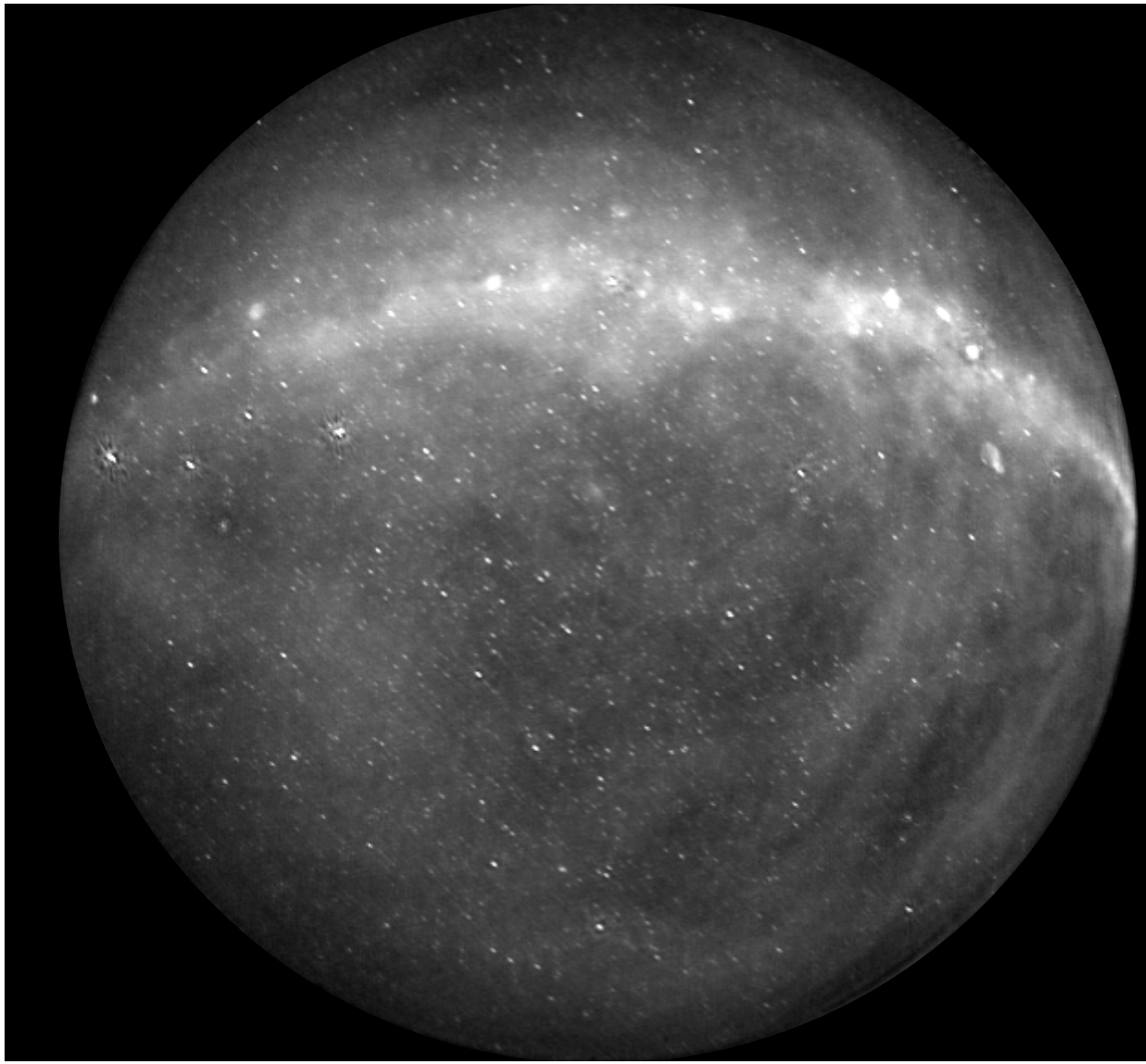
The Owens Valley Long Wavelength Array (OVRO-LWA)…

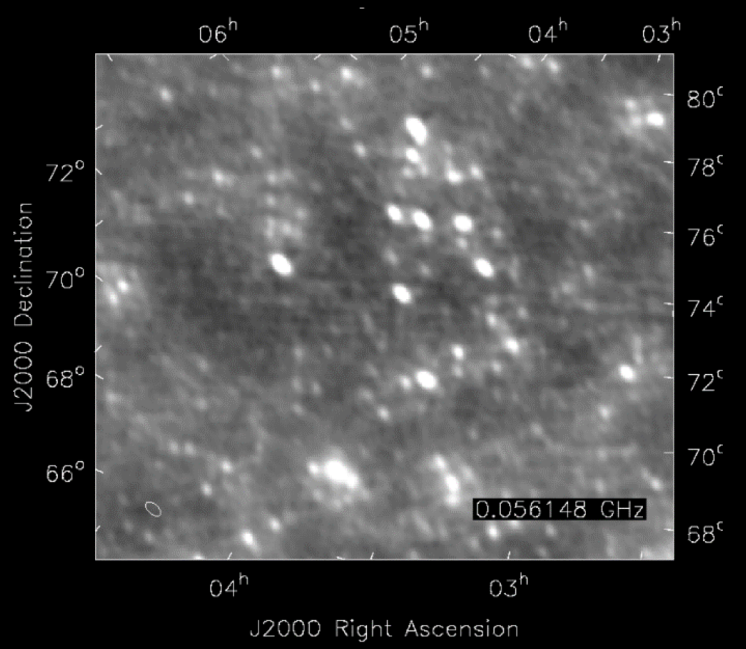
- Operates at low frequencies
- With sufficient sensitivity
- And all-sky FOV…to detect prompt radio emission.

GW-EM follow-up

Continuous mode of operation means we are observing simultaneous to GW event, regardless of trigger lag time.

Upgrading to 40TB RAM to buffer raw voltage data and search for pulses on all timescales.





Currently ~800 mJy snapshot sensitivity.

Stage III array will achieve ~150 mJy snapshot sensitivity.