

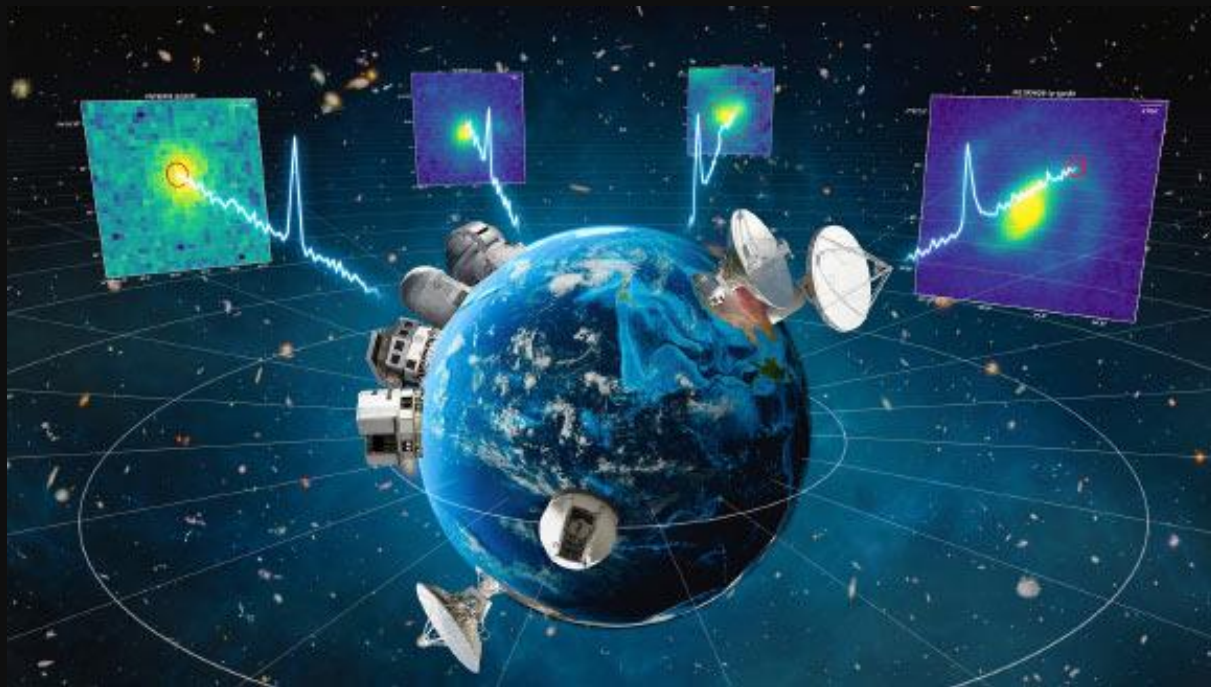
# Revealing the Environment of the **Most Distant Fast Radio Burst** with the *Hubble Space Telescope*

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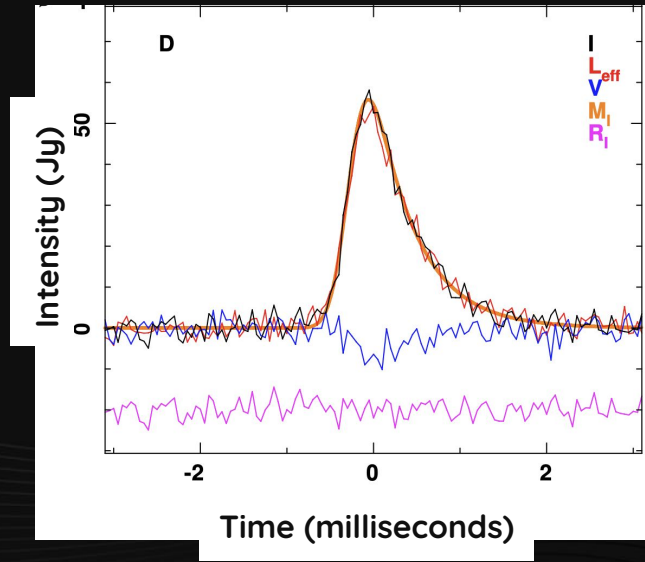
Northwestern





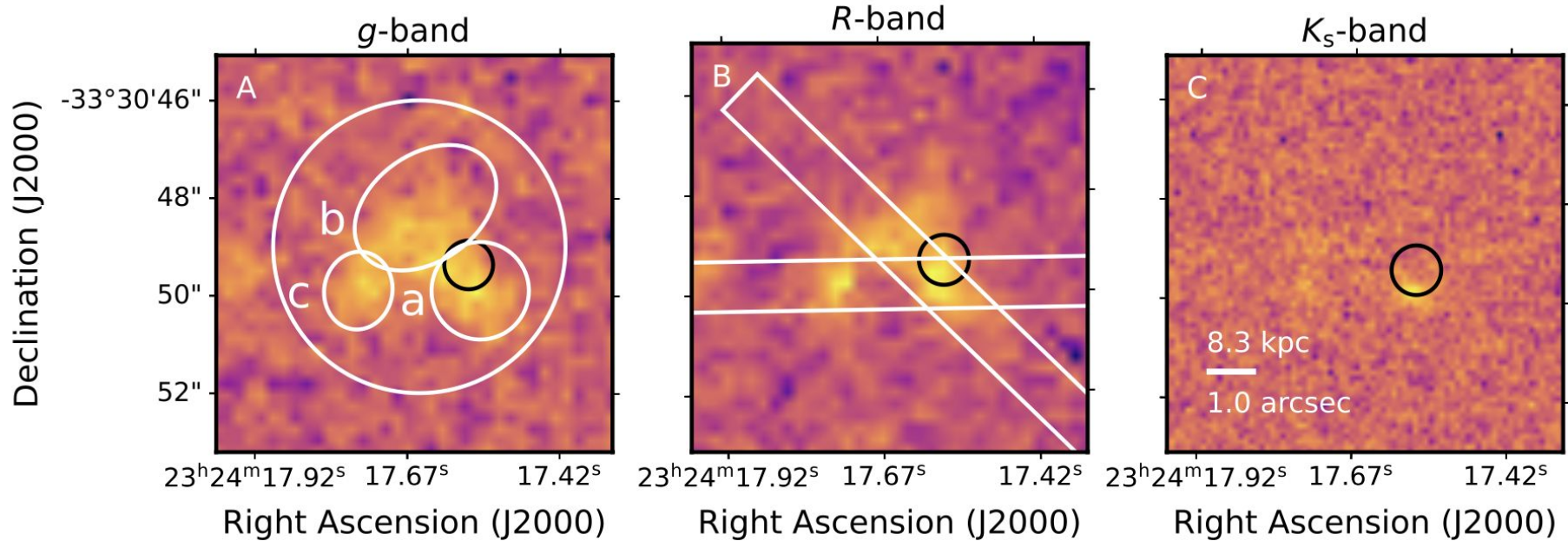
Bhandari *et al*, doi: 10.3847/2041-8213/ab672e / ESO.

## FRB 20220610A



Ryder+23, Figure 1

# Ground-based imaging inconclusive



Ryder+23, Figure 2



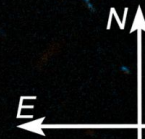
Fast Radio Burst 20220610A  
HST WFC3

F606W  
F160W

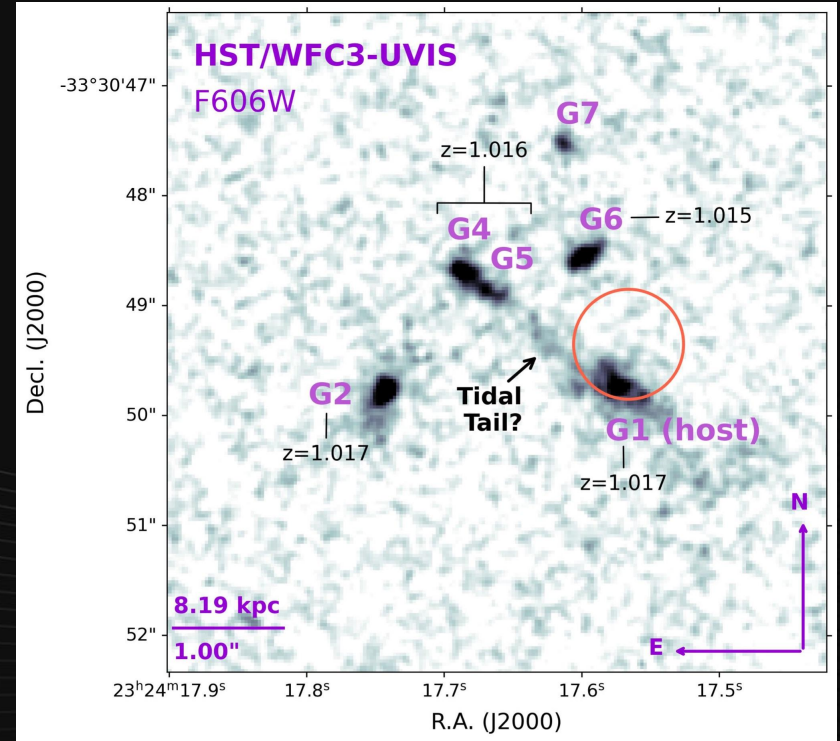
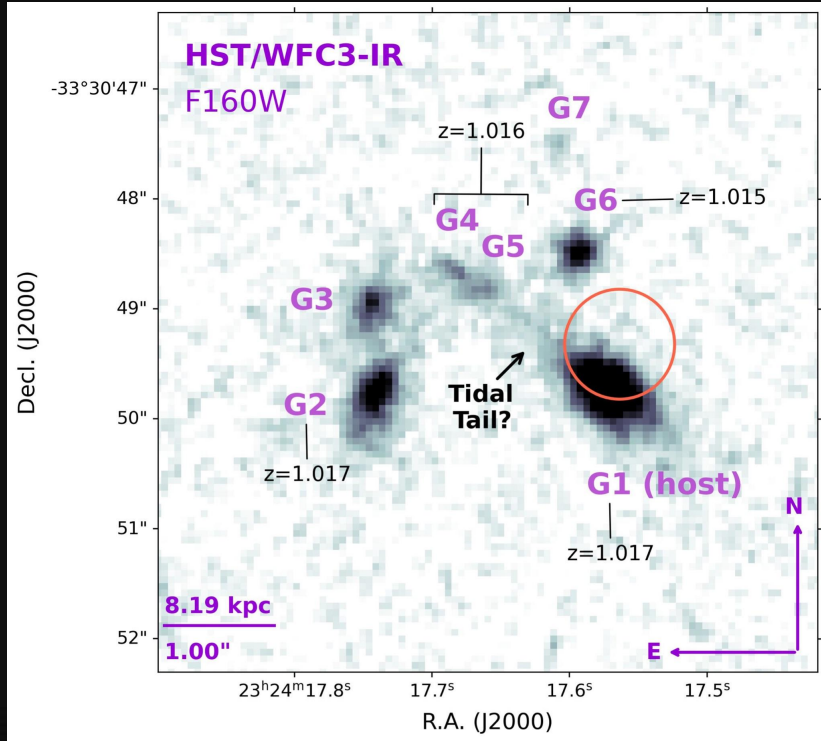


*Hubble Space Telescope (HST)* imaging reveals a **compact group** of seven galaxies

**0.1-1%** of galaxies are found in compact groups at this distance

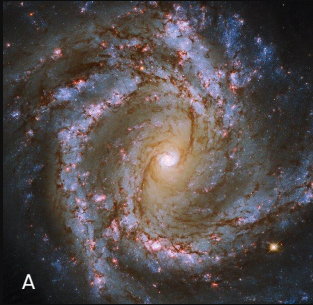


# HST reveals multiple interacting galaxies

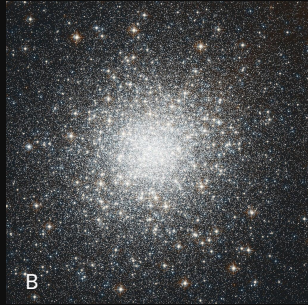


Gordon et al. 2023 (submitted), Figure 1

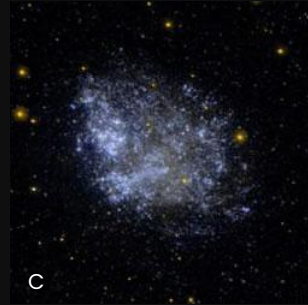
# A novel environment for FRBs



Spiral galaxies



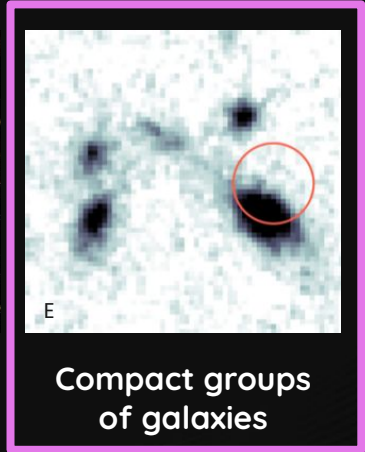
Globular clusters



Dwarf galaxies



Galaxy clusters



Compact groups of galaxies

A: ESA/Hubble  
B: NASA/Hubble  
C: NASA/JPL-Caltech/SSC  
D: NASA/ESA/JHU/UCSC  
E: Gordon+23b





Credit: CHIME

Canadian Hydrogen Intensity  
Mapping Experiment (2018+)



Credit: DSA/Caltech

Deep Synoptic Array (2017+)



Five Hundred-meter Aperture Telescope (2019+)



Very Large Array (2019+)



Credit: CSIRO

Australia Square Kilometer Array Pathfinder (2017+)



Credit: South African Radio Astronomy Observatory

MeerKAT (2018+)

# Summary

- Presented **HST imaging of FRB 20220610A**, the most distant and energetic fast radio burst to date
- The host is part of a **compact group** of seven galaxies - a **novel environment** for FRBs
- At the distance of FRB 20220610A, only **0.1-1%** of galaxies are in compact groups = **rare environment**
- Compact group galaxies frequently **interact and trigger star formation**, which matches the connection between FRBs and recent star formation
- Need more FRBs to place this discovery in context, but **the future for finding more FRBs is bright**

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