Introduction

MIT HAYSTACK OBSERVATORY

- What is MIT/HO definition of mixed-mode observations and data products
- History of mixed-mode observations
- Expected outcomes of workshop

Mixed-Mode Definition

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- Mixed-mode observations refers to observing with both Legacy S/X and VGOS stations simultaneously as if they were part of a single, seamlessly integrated VLBI geodetic network

Mixed-Mode Definition (cont)

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- When we refer to mixed-mode correlation, there are three output products:

    1. Legacy S/X to Legacy S/X baseline
    2. Legacy S/X to "VGOS S/X"[1] baselines
    3. VGOS S/X to VGOS S/X baselines

Note 1: "VGOS S/X" refers to only using (parts of) 3-of-the-4 VGOS bands to match the equivalent legacy S/X bands

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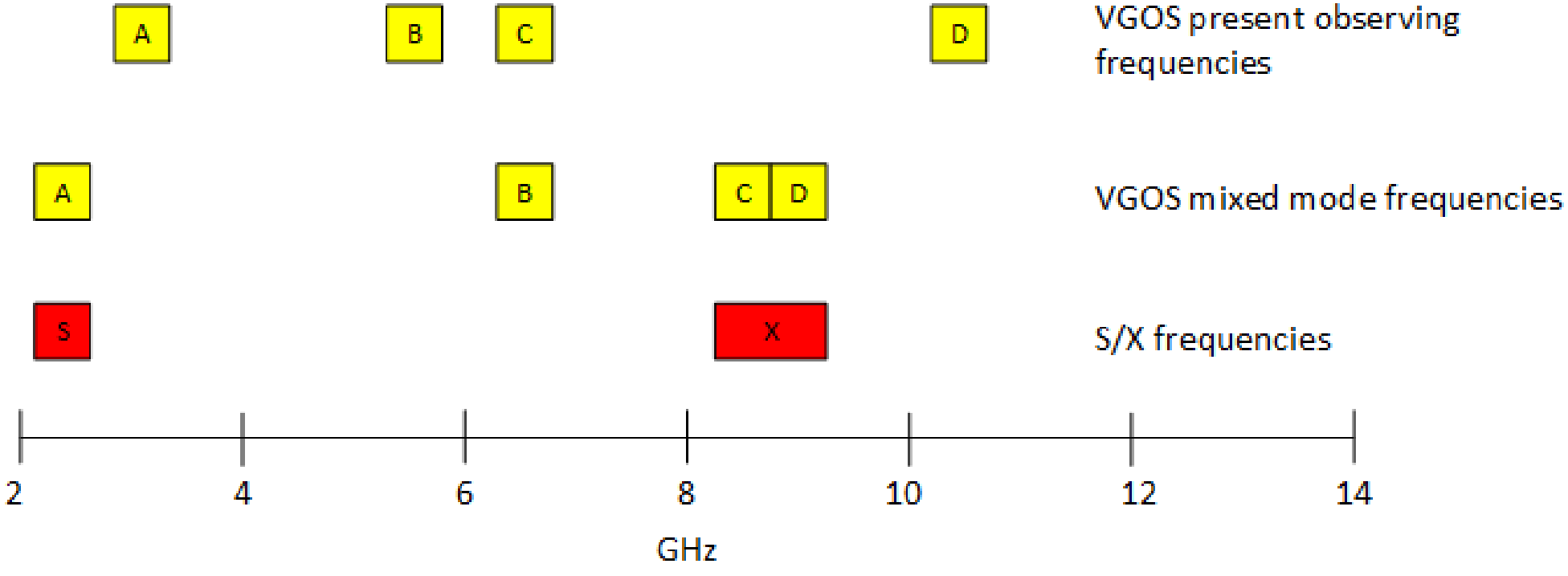
Observing Bands



Additional Correlation Products

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- There are two more correlation products that could be generated from a mixed-mode session (but are not further discussed here):

    1. VGOS to VGOS baselines (all 4 bands)
        - We refer to these as “VGOS à la VGOS”
    2. Legacy S/X to VGOS over very-short baselines
        - We refer to these a “local ties”

Additional Correlation Resources

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Assumptions:

- After TOW2019 we held a VGOS correlation workshop. The information is available online: ***https://www.haystack.mit.edu/conference-2/past-conferences/10th-ivs-technical-operations-workshop/***
- All of presentations for VGOS correlation are posted here (zip file)
- Data from the workshop is available, email chester@mit.edu for access

Mixed-Mode History (MIT/HO)

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- Three mixed-mode sessions were executed prior to 2020
- The goal was to determine how to tie the two VLBI type of networks together
  - Follow the three baseline-type approach (i.e., S/X, S/X – VGOS, VGOS)
  - Identify software issues, develop new
  - Knowledge-transfer to the IVS community … And here we are!

Mixed-Mode History (cont)

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- Schedule was based on R1 sessions
- Standard RD S/X observing network, eight stations
- Used a limited number of VGOS stations in tag-along mode
  - One station for RD1606 (Wf)
  - Two stations for RD1804 (Wf, Gs)
- Officially schedule RD1810 with three VGOS stations (Wf, Gs, K2)

Mixed-Mode History (cont)

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- Uncovered some software limitations
- Determined database generation limitations
  - Reporting
- Evaluated internally the value of the VGOS à la VGOS observations
  - Preliminary results seem promising
  - Currently, non-existing mechanism to submit this with an existing S/X session

Mixed-Mode Present

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- Executed a series of three mixed-mode sessions in 2020: RD2005, RD2006, and RD2007
- Building on the success of prior sessions, the goal is to tie the entire VGOS network to the Legacy S/X reference frame
- Involved the standard RD S/X observing network, with 8 stations
- Participating VGOS stations jumped from 3 to 8
- The result was a significant increase in size and complexity
- Two sessions released for ITRF2020

S/X and VGOS Observing Network (RD2006)

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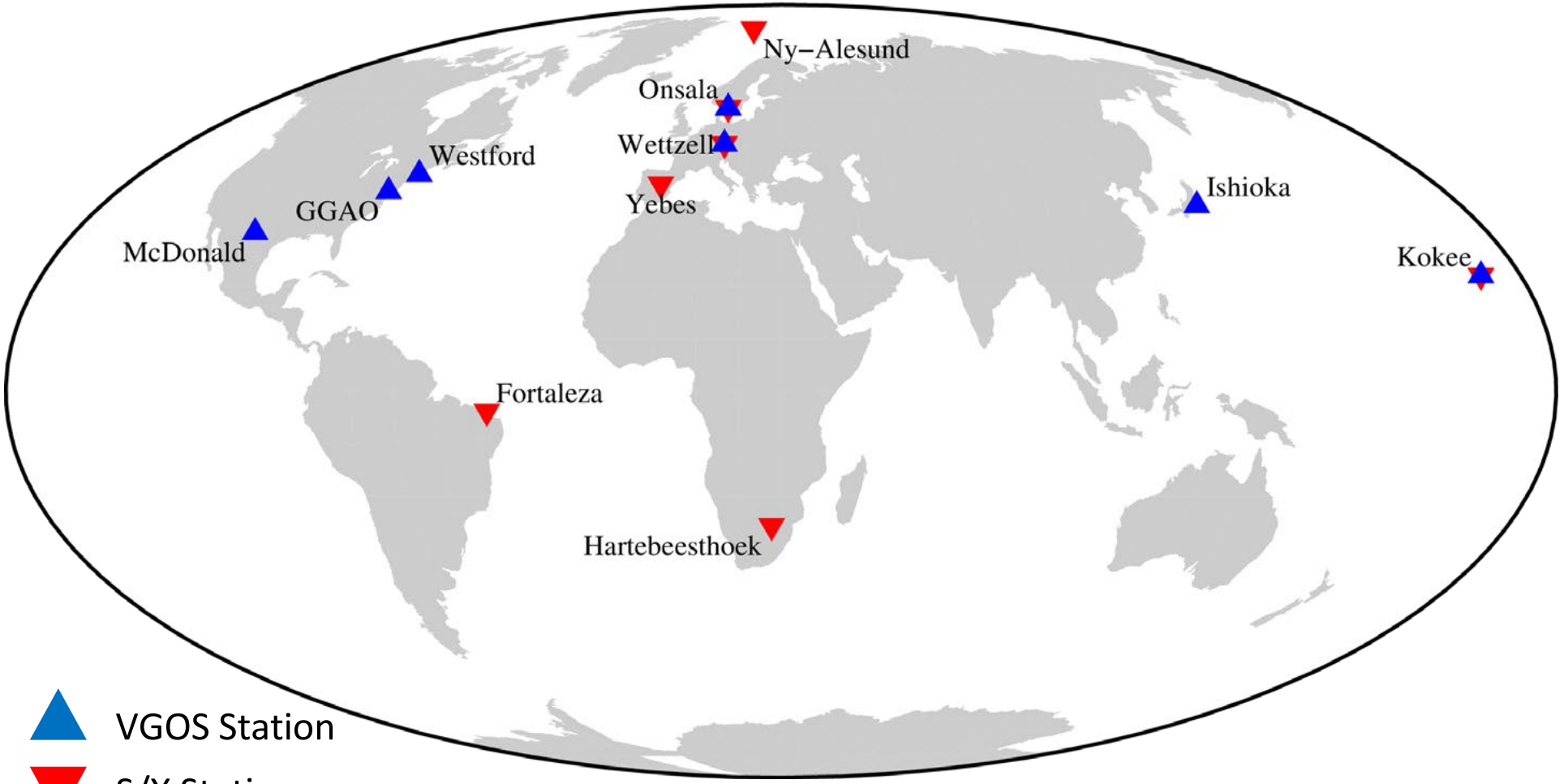

VGOS Station

S/X Station

Co-located Sites

Workshop Outcomes

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- Introduction to the mixed-mode correlation approach followed at MIT/HO

- Community discussion of where we go from here