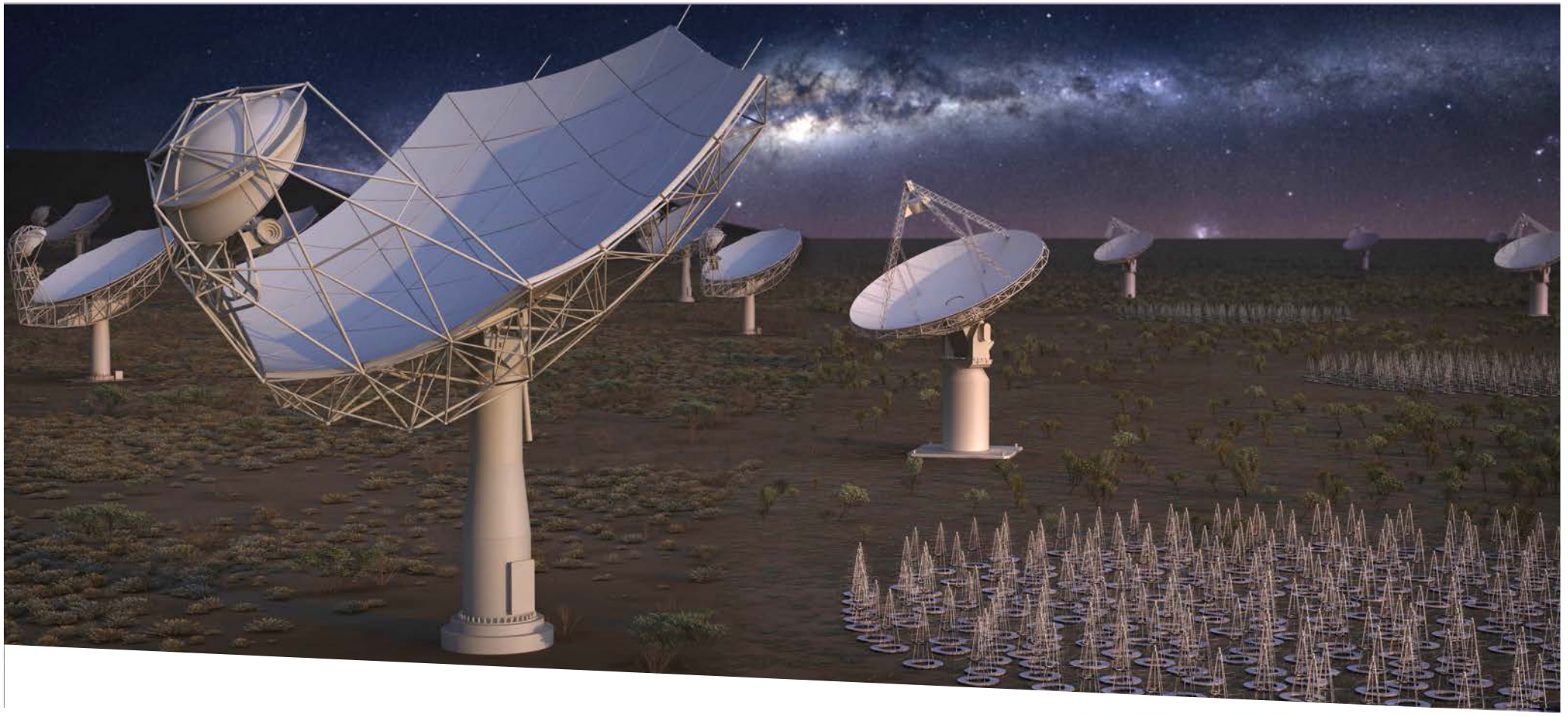
SWG Science Update



Robert Braun, Science Director

SQUARE KILOMETRE ARRAY

Exploring the Universe with the world's largest radio telescope

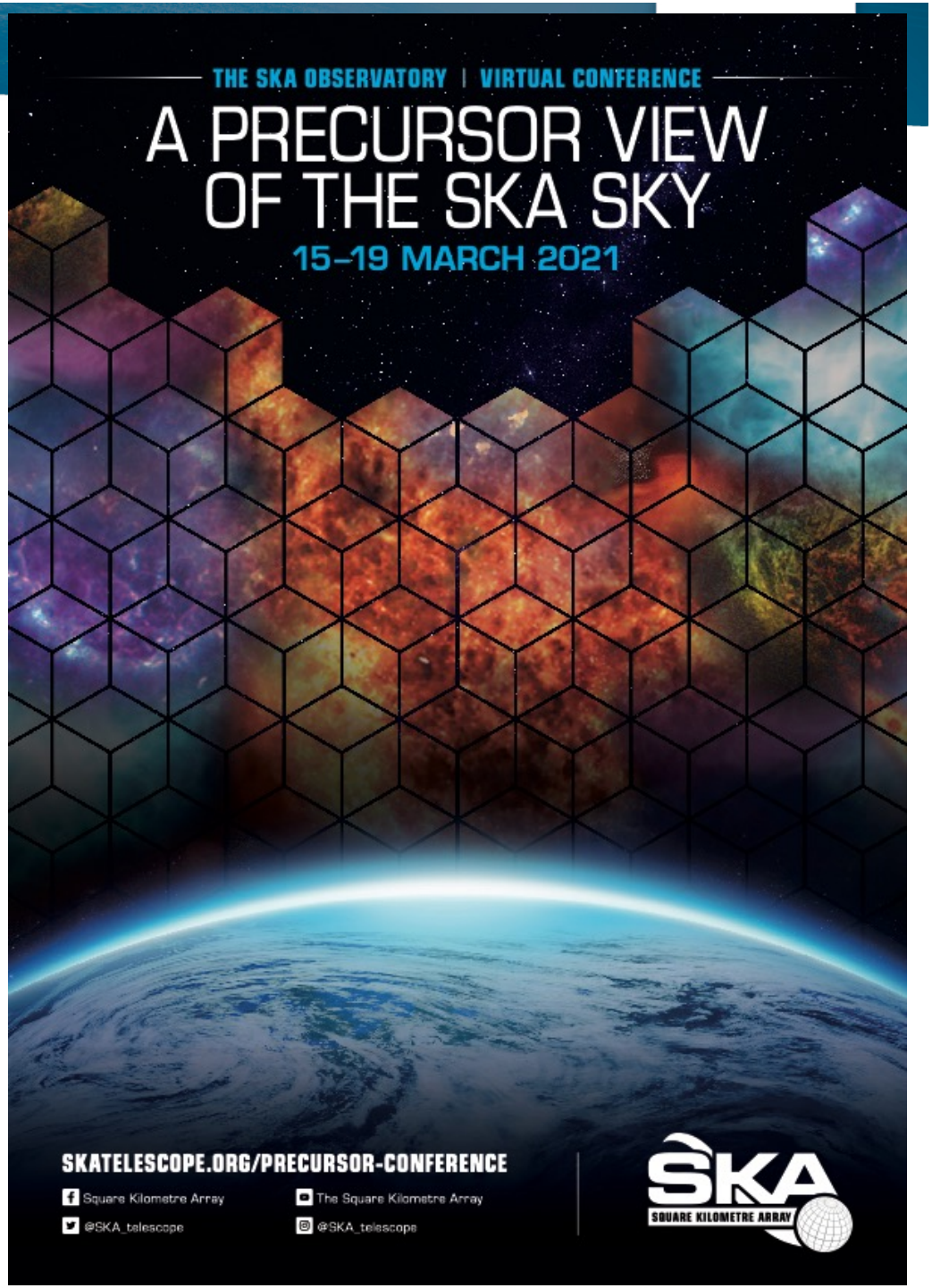
16 Feb 2021

Science Activity Updates

- Next Science Meeting
- Science Data Challenges (SDC2 and beyond)
- AOB

SKA Science 2021

- 15 – 19 March 2021
- Using the OnAir platform
- Plenary talks:
  - ~400 abstracts submitted, review by SOC
  - Plenary talks pre-recorded, with live Q&A sessions, repeated in different time zones
- Website and registration live
  - 300+ registrations so far
- Splinter meetings
  - Organised independently by the SWGs
  - Live talks/ discussions, time zones based on SWG geographical spread
- Poster sessions
  - Gather.town virtual poster sessions
  - OnAir browsing of poster materials



SKA Science 2021 Draft schedule

UTC		Monday	Tuesday	Wednesday	Thursday	Friday
6:00 AM						
7:00 AM						
8:00 AM						
9:00 AM		P1	S1	P4	P6	P7
10:00 AM						
11:00 AM						
12:00 AM						
1:00 PM		poster	poster	poster	poster	poster
2:00 PM						
3:00 PM		P2	P3	P5	S2	P8
4:00 PM						
5:00 PM						
6:00 PM						
7:00 PM						
8:00 PM						
9:00 PM		P1 repeat	P3 repeat	S3	P6 repeat	P8 repeat
10:00 PM						
11:00 PM						
12:00 PM						
1:00 AM		poster	poster	poster	poster	poster
2:00 AM						
3:00 AM		P2 repeat	P4 repeat	P5 repeat	P7 repeat	S4
4:00 AM						
5:00 AM						

- Plenary Sessions 1 – 8: each has two blocks of 4 talks with a short break, repeated once to accommodate multiple time zones (view any two of the
- Splinter Sessions 1 – 4: organised independently by the SWGs with up to 14 in parallel
- Poster Sessions: two 1 hour slots on each day to concentrate virtual interactions, poster materials available entire week in non-interactive mode

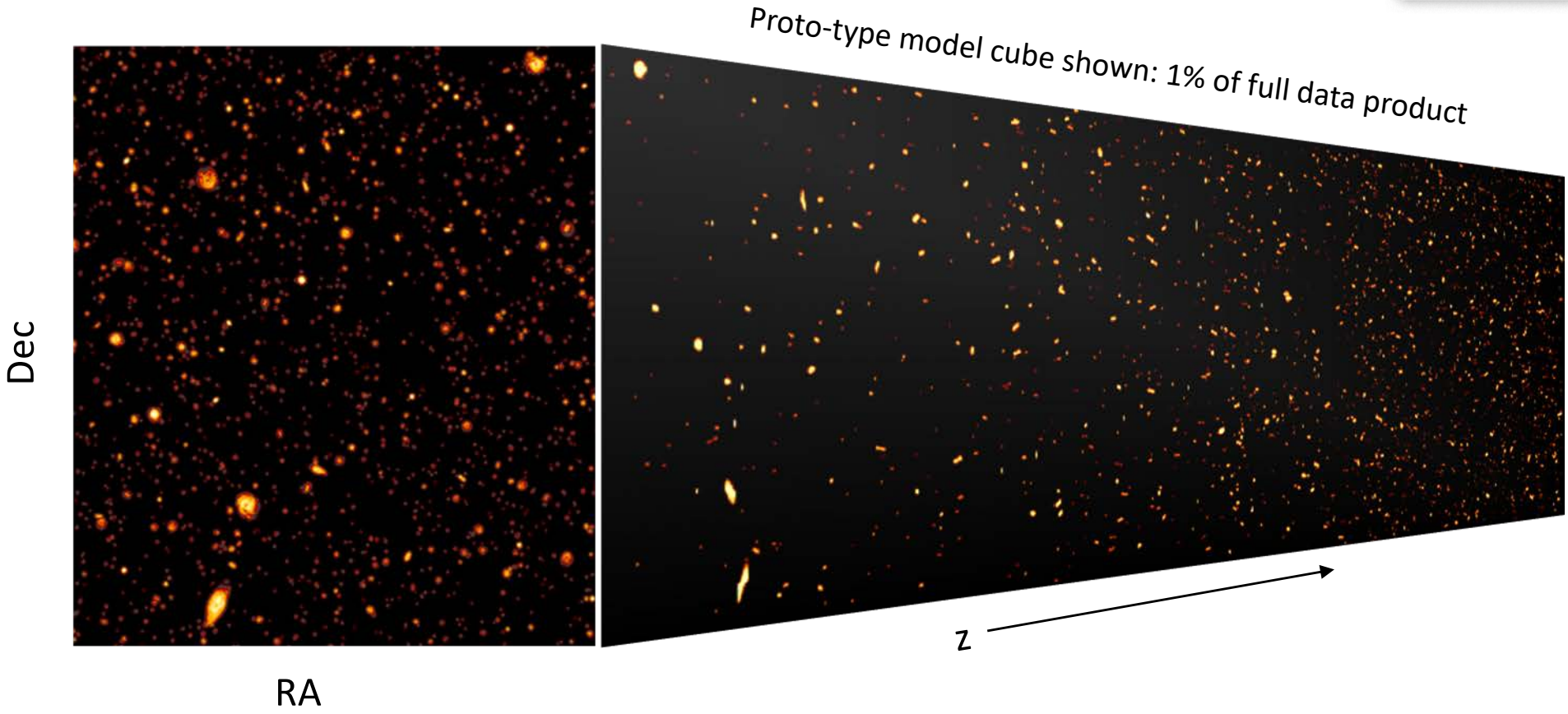
SKA Data Challenges

- Three distinct “flavors” of Data Challenge (Doc. #1016)
  1. Science Data Processor Challenges
     - Effectively being undertaken now within regular PI planning intervals
  2. SKA Regional Centre Challenges
     - Serious discussion now begun within SRCSC Working Groups should lead to concrete outcomes within 2021
  3. Science/Key Science Project Challenges
     - Major focus of SKA Science Team (and growing) with extensive support from SKA Ops (scoring, HPC centre interactions, containerisation, etc.)

SKA Science Data Challenge (SDC2)

Task	Status
Dataset	Prototype HI and continuum data shared for feedback via HI SWG chairs Full data product now released for analysis
Computational resources	Agreements with 8 HPC facilities to provide computational resources for the challenge Discussion of follow-on arrangements
Supporting website	Dedicated website containing links to the test data, instructions, details of the HPC facilities, leaderboard, links to discussion forum, etc.
Scoring code	SDC2 scorer now live for continual self-assessment of team performance on “development” cube posted to leaderboard (final score on real cube at end)

• (Fairly) big data



- Integration time = 2000h
- Spatial/Frequency resolution = 7 arcsec / 30 kHz
- Nominal RMS per channel 13 – 18 μJy
- FoV = 20 square degrees
- Frequency = 950 MHz – 1150 MHz (z = 0.25 to 0.5)
- Data volume = 1 TB

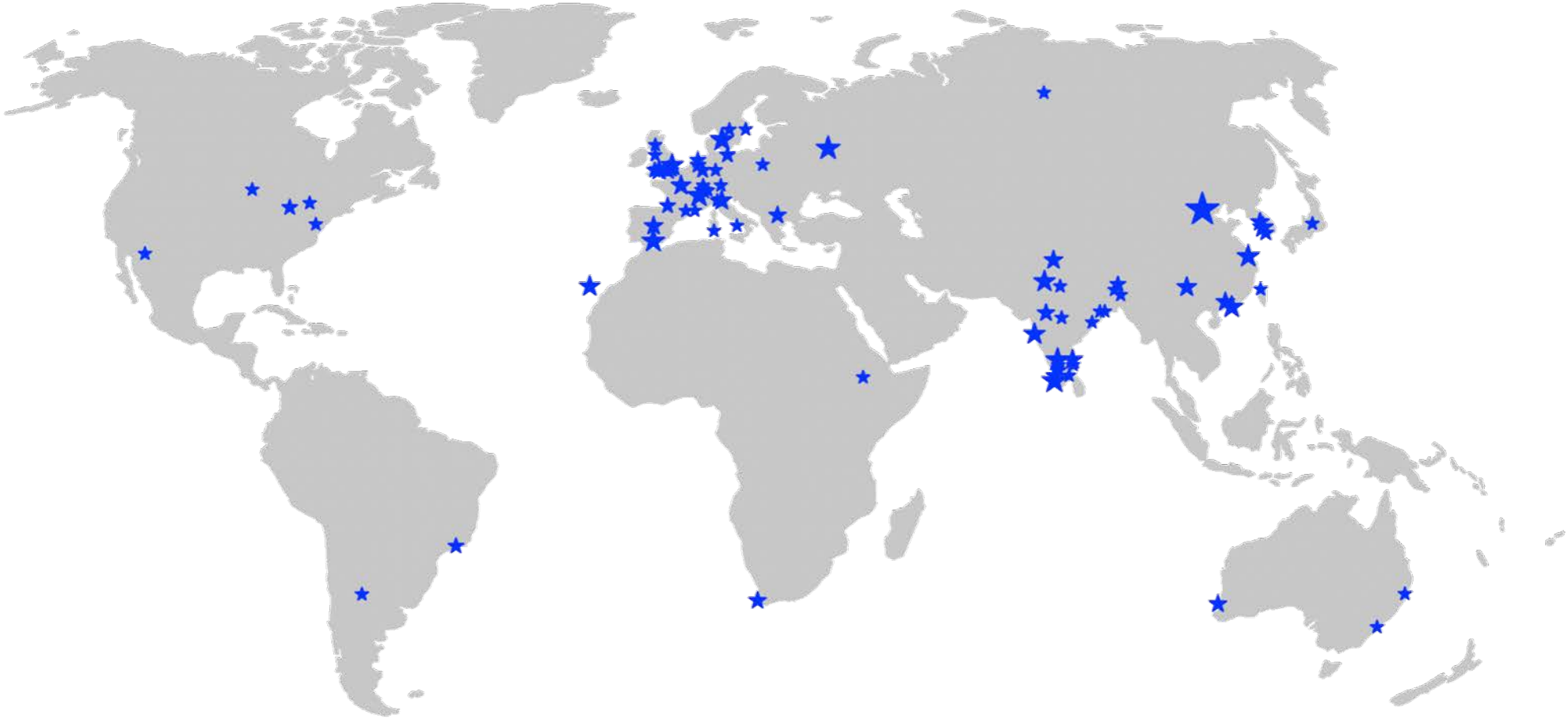
- Almost 10^6 simulated neutral hydrogen galaxies and 10^7 continuum sources (not shown here)
- Expect up to 10^5 HI detections with more than 10^3 well-resolved

SDC2 timeline

- October 31st: Close the expressions of interest call
- Mid November: Open challenge registration
  Pair teams and resources
  Test dataset transfer and scoring code
- December: Validation cube available
- January: Teams getting set up on HPC centres
- February 1st: Challenge processing begins
- July 15th: Challenge ends
  Winners announced
  Feedback sought from participants
  Feedback sought from facilities

SDC2 Participating Teams

- 40 Teams with total of 276 participants, from 80 institutes in 23 countries



Data challenge infrastructure

- Simulations
  - In-house compute and storage can produce 1 TB dataset in short time.
- Scoring service
  - Scoring code framework written to allow future scoring algorithms to be added as modules
- Computational resource network
  - (currently supports up to 55 teams in SDC2)
- Website up and running
  - Including discussion forum

Future additions

- Potential to align with **Science Data Processor** (SDP) work:
  - SDP teams are simulating effect of errors on telescope beams resulting in imperfect calibration:
    - Direction-independent effects
    - Direction –dependent effects
    - Residual RFI (post-RFI removal)
  - Future simulations could incorporate these effects
- Potential to support JupyterHub environment (to work with **containers**)
  - Further encourage teams towards reproducibility
  - Would support science community to be able to deploy pipelines in future SRCs

Future data challenges

- Could be facilitated by SKAO, with simulations/modules provided by SWGs
- Possible areas to support:
  - Cosmic magnetism (coordinated by Takuya Akahori)
  - EoR (discussions ongoing with SWG)
  - Transients
  - ….. Call for future challenge ideas to support
- Potential topic for discussion at SKA Science meeting in March

AOB

- ???

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