NRC·CNRC

SKA Regional Centre Activities in Canada

Séverin Gaudet

March 27, 2018

Canadian Astronomy Data Centre

Herzberg Astronomy and Astrophysics

SRC Activities – AACS

- ACURA Advisory Committee for SKA (AACS)
  - Mandate:
    - Promoting and advancing Canadian participation in the SKA
    - Ensuring Canadian scientific leadership in the SKA
  - Recognition that Canadian participation in SKA may require a Canadian SRC
  - SRC should be part of the budget for the operations era funding
  - Proposal timeline: 2019

SRC Activities – CSRCAC

- Canadian SKA Regional Centre Advisory Committee (CSRCAC)
  - Consult with community on rationale for an SRC
  - To define rationale, role, activities and budget for an SRC
  - Possibly:
    - Baseline cost proportional to Canada's share
    - Part of a larger big-data multi-wavelength data centre for astronomy

SRC Activities – CIRADA

Unlocking the Radio Sky with Next-Generation Survey Astronomy

- Successful $9.4M (€6.3M) CFI Innovation Fund proposal (PI: Brian Gaensler)
- *Development of this infrastructure will also allow us to*
  - *train the next generation of Canadian physicists, software developers and data scientists, and*
  - *will establish the capacity needed to host the Canadian SKA Data Centre*

SRC Activities – CIRADA

Canadian Initiative for Radio Astronomy Data Analysis (CIRADA)

- Successful $9.4M (€6.3M) CFI Innovation Fund proposal (PI: Brian Gaensler)
- *Development of this infrastructure will also allow us to*
  - *train the next generation of Canadian physicists, software developers and data scientists, and*
  - *will establish the capacity needed to host the Canadian SKA Data Centre*

www.cirada.ca

CIRADA (PI: Bryan Gaensler)

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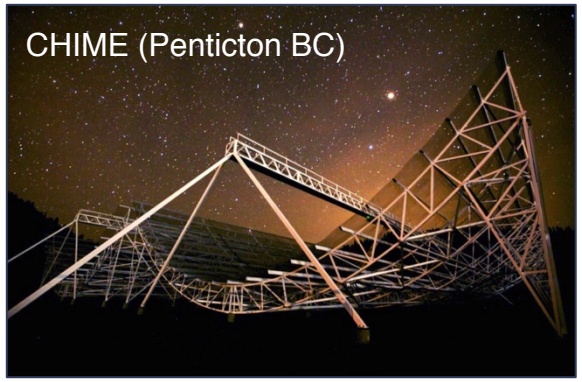
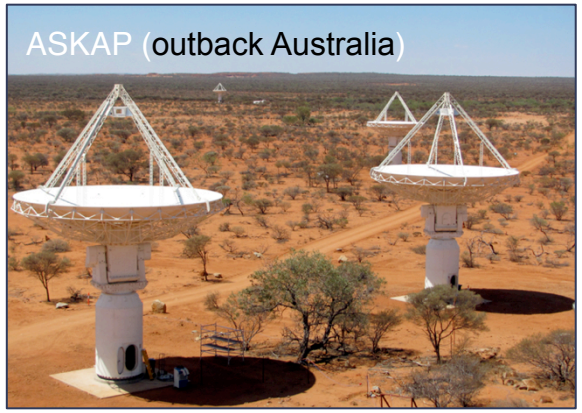
UNIVERSITY OF TORONTO

- Canadian Initiative for Radio Astronomy Data Analysis (cirada.ca)
  - CFI Innovation Fund 2017: $3.5M (CFI) + $3.5M (provinces) + $2.4M (partners) = $9.4M
  - plus $1.2M for management, ops, maintenance
  - five year program, commencing April 2018
  - six Canadian universities: Toronto, Alberta, McGill, Queen's, UBC, Manitoba
  - plus NRC/CADC, Compute Canada, NRAO, ASTRON, IDIA, Cornell, Berkeley, Minnesota
- In a nutshell:
  - all-sky surveys with CHIME, ASKAP, VLASS
  - continuum, polarisation, time domain, HI emission, HI absorption
  - ~20 PB of raw data and basic data products (images, simple source catalogs)
  - **CIRADA:** science-ready data products and advanced catalogues/databases



CHIME

NRAO/AUI/NSF



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CIRADA Science Programs

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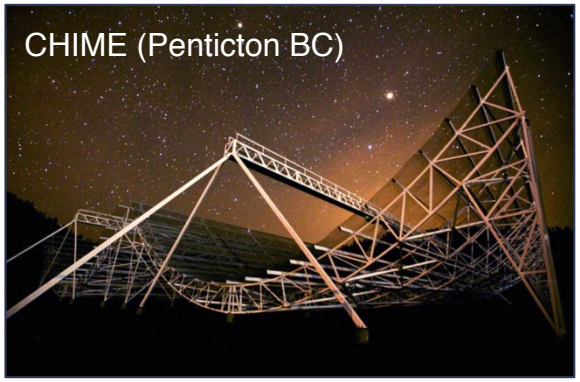
- CHIME (~17 PB)
  - 70% of sky, 400-800 MHz, ~15' resolution
  - 5 year transit survey for BAOs, FRBs
  - CIRADA: commensal observations of transients, polarisation, pulsar search, HI absorption, cosmology foregrounds
- VLASS (~1 PB)
  - 80% of sky, 2-4 GHz, ~3" resolution
  - 3 epochs, 2017-2024
  - CIRADA: continuum, polarisation, transients
- ASKAP (~1 PB)
  - 75% of sky, 1.1-1.4 GHz, ~10" resolution
  - CIRADA: polarization and Faraday (POSSUM), resolved HI emission from galaxies (WALLABY)



CHIME

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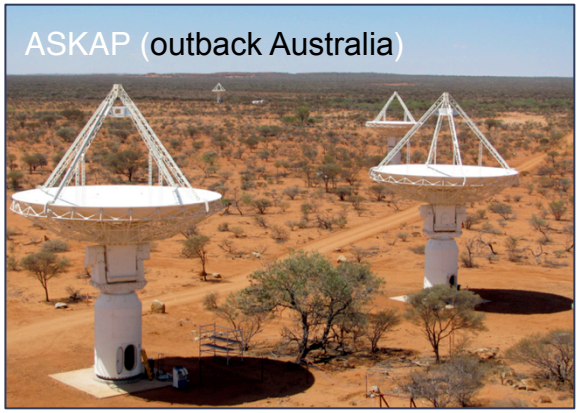

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CIRADA Products and Tasks

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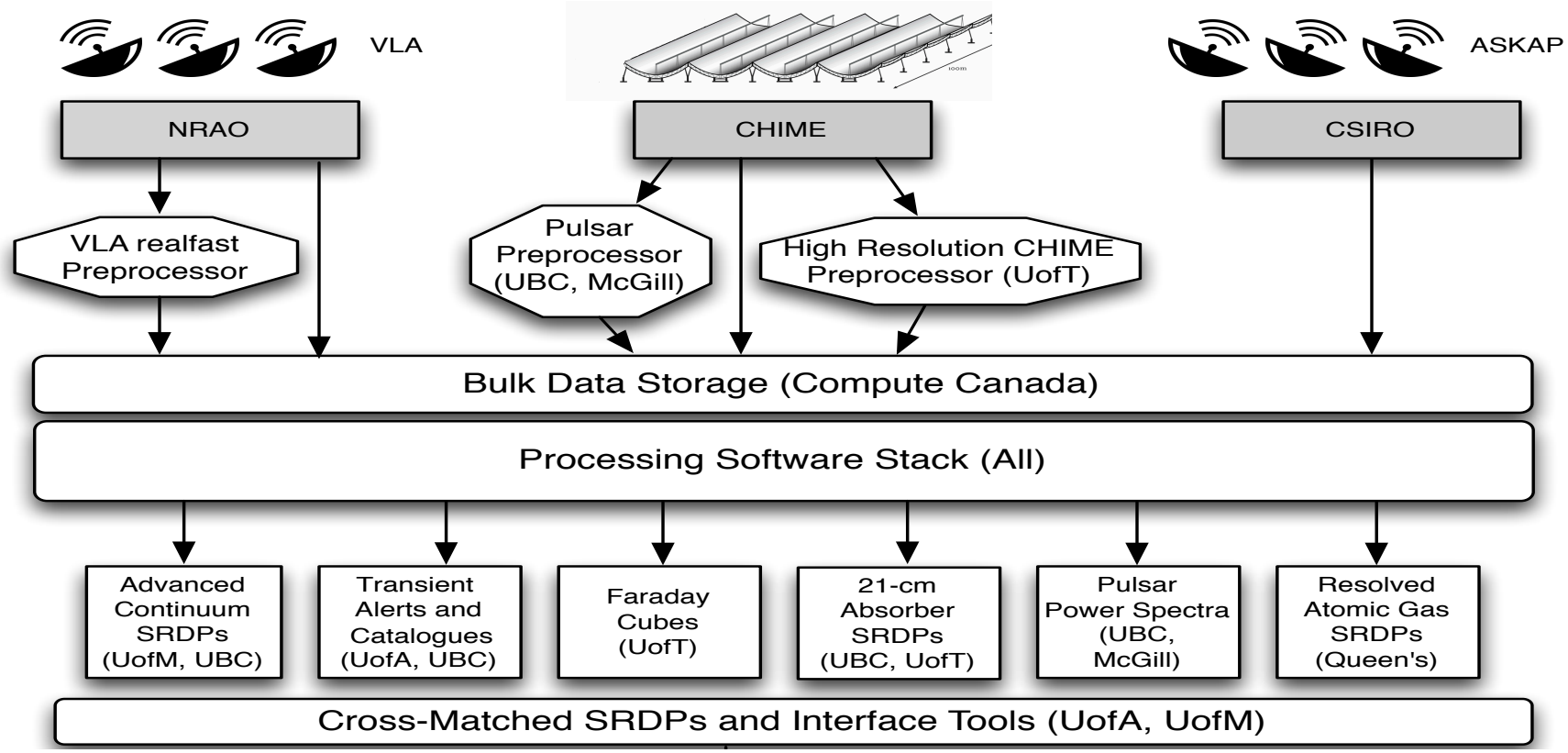
- Advanced continuum products
- Transient source identification
- Faraday rotation products
- Pulsar power spectra
- HI absorption spectrum catalogue
- Resolved HI in galaxies
- Unified processing software stack

- CHIME pre-processor for pulsar searching
- CHIME correlator upgrade for HI absorption
- VLASS fast-transient pre-processing

- On-site and off-site bulk storage



CIRADA Timeline

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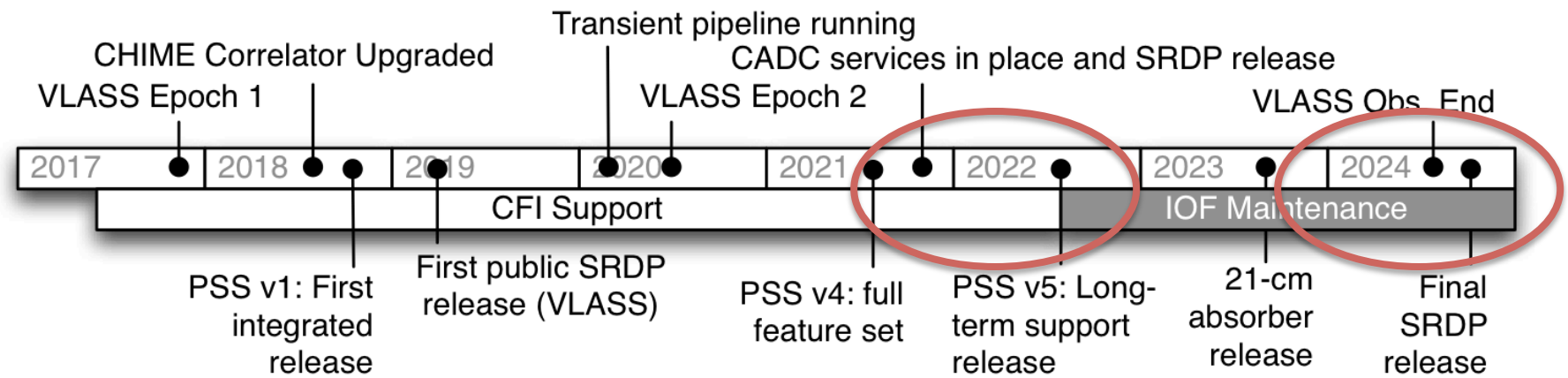

- VLASS
  - Sep 2017 – Jun 2019: Epoch 1
  - 2019: First data release
  - May 2020 – Mar 2022: Epoch 2
  - 2022: Second data release
  - Feb 2023 – Oct 2024: Epoch 3
  - 2025: Final data release

- ASKAP
  - 2018: early science program
  - 2019-2021: full science program
  - 2022: WALLABY & POSSUM final data release

- CHIME
  - 2018: correlator upgrade
  - 2019: pulsar & HI observations begin; cosmology foreground development
  - 2021: transient monitoring pipeline, RM synthesis / polarisation
  - 2023: HI absorption catalogue

- Processing software stack
  - 2018: v1, first integrated release
  - 2019: v2, initial VLASS functionality
  - 2020: v3, 21cm data, source classification
  - 2021, v4: full feature set
  - 2022, v5: long-term support release

CIRADA and SKA

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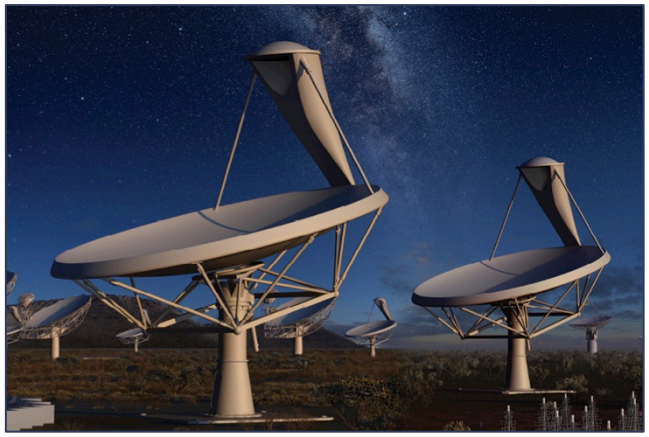
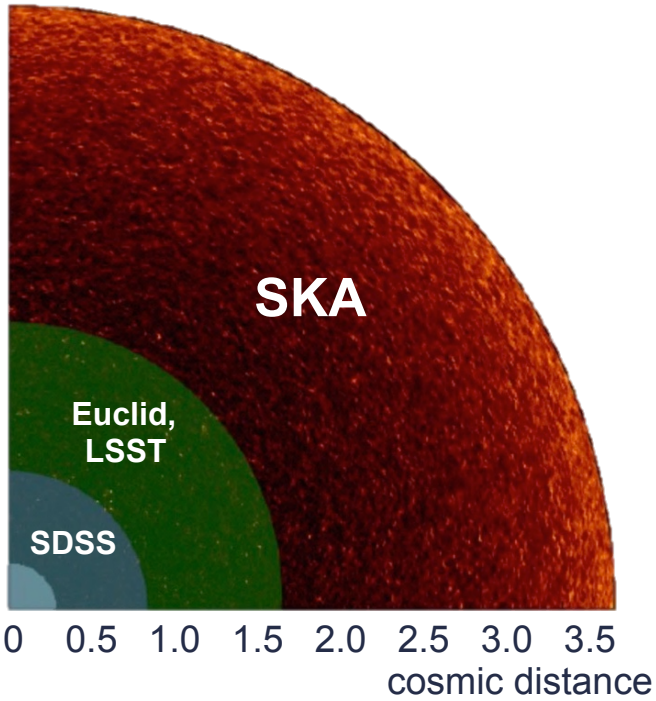
- CIRADA
  - path to university engagement in SKA design
  - pilot program for a Canadian SRC
  - establishes SRC capabilities & specifications
  - creates links with other SRC programs



SKA



Alonso (2015)

A Canadian SKA Regional Centre

- Challenges
  - Rationale
  - Understanding how users will use a regional centre
  - Matching infrastructure to support user workflows
  - Estimating processing and storage requirements
  - Full costing of the SRC
  - Coordinating building blocks: Universities, Compute Canada, NRC HAARC and CADC, CANARIE

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National Research Council Canada

Conseil national de recherches Canada

Canada