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Workshop on Academic-Government Partnership (AGP)
in Atmosphere Related Research
Discussion of *AGP Focus Paper*

Working Group on Atmosphere Related Research in Canadian
Universities (ARRCU),
Academic-Government Partnerships Committee
January 20, 2017, Faculty Club, University of Toronto

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Introduction

- Good morning, please register, fill in a name tag, get some coffee and snacks.
- We'll first do a go round of introductions, then review the agenda.
- Those online, please be prepared to introduce yourselves – we want you to be part of this. You will be called in the order you appear on the WebEx participants list (if identifying info is provided) and if we miss you please speak up.
- If you have slides you'd like to share please let Bob and Paul know and we'll try to fit them in or at least post them on the ARRCU website after.

Meeting Agenda

- 09:30-10:00 Registration/coffee/online setup
- 10:00-10:30: Introduction
- 10:30-12:00: Partnerships, Infrastructure, International Connections
- 12:00-13:00: Lunch (provided)
- 13:00-14:45: Education, PARRC, Quantifying university capacity, Intro/Conclusion/Appendix material
- 14:45-15:00: Break
- 15:00-16:00: Conclusion
- 16:00: Adjourn
- 18:00 or so: dinner for those interested, self pay

Context: ARRCU

- ARRCU established Fall 2014 to represent academic community in atmospheric and related sciences.
- ARR domain:
 - Weather, climate, air quality
 - Atmosphere and connected components of the Earth system.
- Goal: Develop strategic plan to *configure academic ARR to provide most benefit to Canada*.
- Self organized group with event-specific cash support and a *great deal* of in-kind support.
- We have received formal endorsement from NSERC, CMOS, and are continuing to seek other endorsements or statements of support.

Context: AGP Paper

- ARRCU White Paper (2015) recognized need for strategic planning in *applied partnership research*, as well as need for sustained fundamental research support.
- Strategic plan built on focus papers: AGP, academic-industry partnership, education/outreach, other topics.
- AGP focus paper:
 - September 2016: Idea proposed
 - November 2016: Outline discussed in videoconference
 - Jan. 13 2017: Draft 1 released
 - Today: Workshop to discuss Draft 1
 - Feb. 3: Comments on Draft 1 due
 - Feb 2017: Penultimate draft released
 - March 2017: Paper finished* and posted
 - March/April 2017: Signatures and support sought

*We will later discuss which parts of the paper could be left open for revision.

AGP Paper

- Coauthors are ARRCU Government Partnerships committee: Kushner, Bowen, Brunet, Myers, Piekutowski, Shepherd
- Target audience (as stated in paper):
This paper is intended to communicate with our research colleagues across all sectors, our university leadership, and decision makers.
- The paper is split into sections that we will discuss in turn, led by point people on the sections.
 - Partnerships (PK)
 - Research Infrastructure (PM)
 - International Connections (MS)
 - PARRC (advisory panel) (GB)
 - Education/training (PM)
 - Quantifying University Capacity (PK)
 - Introduction/Conclusion/Appendixes (PK)

Format for Each Section

- A couple of review slides from discussion lead.
- We then open the floor to discussion.
 - Is the strategic planning in this area on track?
 - Are the intent and outcome of this section clear?
 - Is the text/argument logical?
 - How could more impact be achieved (e.g. points highlighted, immediate actions undertaken)?
 - What are *key recommendations* that should be highlighted at the end of each section.
- This is the right time for frank feedback and fresh ideas.
- We will try to capture, summarize, and respond to all feedback through the review process (comment/reply spreadsheet), as was done for the White Paper.

Questions?

Research Partnerships (PK/MS/GB)

- This section represents main statements on priority areas for partnership and mechanisms/programs for partnership.
- We've had useful feedback on this section which we'll see in a moment.

Academic-Government partnership in ARR: Research priorities

- To develop and apply unified Earth-system models (integrated weather, climate, chemistry, biogeochemistry) for weather, air quality, and climate forecasts and projections.
- To advance utilization of space based observations through development of data assimilation systems for physical and chemical atmospheric parameters and land surface conditions.
- To develop and apply methods for atmospheric monitoring, emissions measurements, including development of observation-model fusion methods for regional and facility-scale emission source characterization.
- Priorities in environment and agriculture: strengthening water resource sustainability in agriculture, adapting agricultural production systems to climate change, disaster mitigation for climate extremes.
- *Other research priorities listed here.*

**Discovery
to Application**

**Academic-government research partnerships on
weather, climate and air quality to benefit Canada
in a time of rapid change.**

**Application to
Discovery**

Academic-Government partnership in Canadian ARR: Priority Applications

- To develop weather and air quality prediction and warning systems.
- To inform air pollutants, toxics, and greenhouse gas regulations and reporting (frameworks including: CEPA, Canada/US Air Quality Accord, UN ECE LRTAP and the UNFCCC, and GoC Enforcement).
- To develop climate prediction and projection systems to provide input into climate services. Inform the Pan Canadian Framework for Clean Growth and Climate Change: The mitigation and adaptation goals related to the Paris agreement.
- To reduce disaster risk related to weather and climate change as guided by Public Safety Emergency Management.
- To advance climate resilient infrastructure under the Green Infrastructure program and to assess Canada's general climate resilience.
- *Other applied priorities listed here.*

Feedback and Questions

- Jon Abbatt:
 - *no mention of "fundamental research" which is what many in the academic community do and which underpins the whole field.*
 - *Recommendation is to have this as the first bullet in the research priorities section: "Development of fundamental knowledge of the atmospheric system".*
 - *I realize that government agencies may not have this as their mandate but universities do, and so having this stated explicitly is important. If not, all the research priorities now listed are largely "solutions driven".*
 - *Given that this document is one that may be pointed to when groups/individuals apply for funding, we need to have that "fundamental knowledge" aspect up front and central, in my opinion, so that it is clear where many in the academic community are coming from.*
- Let's discuss this critical point.
- Under Research priorities – other additions?
- Under Applied priorities – other additions?

Partnerships: Key Recommendations

Partnerships in Research Infrastructure

- Strategic planning in research infrastructure may have many advantages
 - Joint applications to obtain the resources needed to develop and operate the infrastructure
 - Collaboration in using the infrastructure to carry out cutting edge ARR science
 - Partnerships for maintenance and ever-greening of these facilities and associated resources
 - The operational lifetime of ARR infrastructure often exceeds that of individual projects (3-5 years) and thus requires a longer planning horizon (5-10 years)
- Broad community use of infrastructure, ranging from satellite data streams to computing resources, models, etc., is the increasing norm today.
 - This is especially the case in open-source modelling and open access data archives
 - Advantage of a large community working to access infrastructure, data, develop and improve codes
 - Opens the doors to many partnerships
 - Also facilitates training and the ability for ARR HQP to transition between academia and government

Infrastructure Type	Examples
Space-based infrastructure for global remote sensing of atmospheric composition and dynamics for process studies, assimilation in models and monitoring trends.	ACE-FTS spectrometer on SCISAT (2003), cloud radar on Cloudsat (2006), radiometer on SMAP (2015), wind lidar on ADM-Aeolus (2017), interferometric radar on SWOT (2021)
Ground-based infrastructure, including unique field stations and distributed observing networks (with consistent sensors).	CCAR CCRN, PEARL/PAHA, CHARS, ...
Field campaign infrastructure (instruments, airborne platforms, ships, moorings) – includes deployment platforms and equipment to be deployed. Such equipment will include both equipment deployed for an extended period in the field (e.g. moorings) as well as equipment mounted just for the experiment.	NETCARE, ... CSA-CNES stratospheric balloon program
Advanced research computing and other information technology resources, covering hardware, software, and datasets. Hardware includes CPU and mass stores. Software includes models (Earth system models, NWP models, chemical transport and air-quality models), retrieval workflows, analysis software for large complex data sets (e.g. climate, satellite, remote sensing).	Compute Canada resources (SciNet, SHARCNET, WestGrid, etc.), ECCC/DFO/DoD/university models, climate data records from ECCC and NRCan, etc.

Infrastructure: Key Recommendations

International Connections (MS/GB/PK)

- Coordination of Canadian international engagement will contribute to federal government knowledge and tools to inform weather, climate and air quality policy, regulations and services.
- Canadian ARR contributes:
 - Strengths in modeling, prediction, Arctic and cryosphere, aquatic environments, etc. all key to study of global atmosphere-related processes.
 - Data from national observational programs to global observing networks and satellite infrastructure, enabling our own and others atmospheric research.
- International engagement to benefits Canada:
 1. Leverage the international capacity and programs to advance science of specific interest to Canada.
 2. Maintain scientific expertise and infrastructure at the leading edge, enables us to inform Canadian policy, regulations and services with the highest calibre state of art knowledge.
 3. By filling expertise and capacity gaps, No one Canadian institution or community can undertake the full breadth of diverse expertise in ARR.

Broad types of international engagement for us to access/manage more effectively :

- Multi-lateral UN based programs coordinated by WMO, UNEP, IOC and UNESCO. Includes WWRP, WCRP the WMO Commissions and their Expert Groups.
- ICSU Future Earth and Global Research Projects (iLEAPS, SOLAS, IGAC), the international Commission on Atmospheric Chemistry and Global Pollution (iCACGP).
- Collaborative research programs inviting international participants, particularly in Earth observations (ESA Earth Explorer satellites, NASA AboVE)
- National government sponsored opportunities: EU Horizon 2020, NA CEC, NA IAI, etc.
- Science assessments of UNEP, WMO, Arctic Council and IPCC

- **A Need:** Mechanism to improve communication, coordination and funding of ARR in Canada to more effectively participate in international opportunities.
- **Considerations:** Cdn academic – gov engagement internationally needs to address 5-7 year planning horizons and link clearly to our priorities.
- **Recommendation:** Include international member(s) on PAARC
- **Recommendation:** Explore mechanisms to nominate both academic and government scientists to WMO, UNEP, WCRP, Arctic Council, IPCC, CEOS, Future Earth expert teams including financial support.
- **Who??** Federal science based departments, the granting councils and National Research Council all have a role to play, facilitated by PARRC.

International Connections: Key Recommendations

Education and Training

- Universities have the unique mandate of being responsible for academic education
 - Provide the people to populate government operations, industry and research
 - Strategic planning is needed to identify strengths, gaps and needed coordination
 - Given links to industry and other factors, this area will eventually be covered in a separate focus paper
- Important to increase exposure to atmosphere-related science (including the physics, chemistry, and biogeochemistry of the Earth system and its components) in the present-day school curriculum
 - Exposure will encourage students to consider further education and career in our fields
 - Such exposure can happen if ARRCU raises awareness in school boards of the professional possibilities that a strong training in ARR
- Need to bring better information to undergraduate education programs about the needs and opportunities in government-based research, on the same planning horizon as our research partnerships
 - Universities need to keep current on what is needed by working atmospheric and related science professionals within government so that students graduate with the skills qualifying them for work within government agencies
 - Opportunity for academics and government researchers to communicate their views on the trends in training requirements

Education and Training - Graduate

- Planning will aid university faculty members to share and teach towards these areas of need within government departments on the strategic planning horizon time frame
 - For students interested in applied areas, this will ensure that their research is relevant to current and medium-term needs
 - For students with an interest in more fundamental research, this awareness will allow them to efficiently plan their future professional work as necessary
- We recommend enhancing the scope and opportunities for HQP training using various grants and contributions mechanisms in government laboratories
 - Additional ways to provide and facilitate internships and extended research stays in governmental labs would be beneficial
 - We recommend facilitating HQP training through providing government scientists enhanced opportunities to serve as visiting scientists at academic institutions
- Many HQP could be made much more aware of available research and job opportunities within government departments, by the development of a common job market posting resource and by regularly holding jobs fairs and career interview sessions at CMOS, CSC, and CAP meetings

Education: Key Recommendations

Panel for ARR in Canada (PARRC)

The Canadian ARR community needs: i) to enhance communication and coordination of academic and government scientists; and ii) a more unified approach to innovations arising from atmospheric-related research (e.g., insuring a long term legacy of academic research).

- The Panel for ARR in Canada (PARRC) overarching goals:
 - to ensure that we configure academic-government partnership in ARR to most benefit Canada;
 - to sustain and strengthen ARR international leadership, research infrastructure, education and training.
- The specific objectives of the PARRC would be:
 - Strategic planning for new research partnerships and priorities:
 - to address emerging national issues;
 - pushing forward and coordinating new initiatives in collaboration with NSERC, CFI and other funding agencies;
 - to ensure effective participation in relevant new national and international research programs.
 - Enabling ongoing smooth collaboration between the academic and government ARR communities by working to coordinate research activities in collaboration with the NSERC, CFI and other funding agencies.

Panel for ARR in Canada (PARRC)

- The specific objectives of the PARRC would be (continued):
 - An *international competitiveness objective* to ensure that the Canadian ARR community has access to internationally competitive tools and infrastructure for maintaining an appropriate national capability in observing, understanding, modelling and predicting the atmosphere;
 - An *education/training objective* to promote the more effective pull through of research to improve government services and training of relevant HQP;
 - To allow the Canadian ARR community to speak with one voice on issues around major joint research programs and infrastructure investments(e.g., promoting ARR HPC requirements to Compute Canada);

Panel for ARR in Canada (PARRC)

- Terms of References

- The PARRC should be composed of government senior scientists (director, chiefs and scientists), university atmospheric department professors, possibly research or high level administrative officers from one or two universities, and one or two representatives from the NGO and industry sectors. The PARRC should aim at a balance between academia and government membership.
- Scientists will be invited for specific discussions, especially for program presentations or new initiative proposals within a recurring strategic planning horizon.
- The PARRC co-chairs should be one government and one academic representative.
- Members should have a mandate of three years (with possibility of one renewal) (four years?).
- NSERC or other funding agencies representatives should be part of the membership (ex-officio?).
- PARRC should meet at least twice a year (with one face-to-face).

PARRC: Key Recommendations

Quantifying University Capacity in ARR

- Working on ideas for draft
- Dave Bowen: NSERC Awards Search Engine
- Keyword search: atmospheric, weather, meteorology, climate change
- 5300 records, approximately \$250 million from 2011-12 to 2015-16



NSERC's Awards Database

Search

Fiscal Year

From To

OR

Competition Year

From To

Name of Person



Keywords in (Award Title and Summary)



Institution & Province



Area of Application

OR

Code



Research Subject

OR

Code



[Advanced Search](#)

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Quantifying University Capacity

- More information needed about University capacity for research if we are to engage in effective strategic planning.
 - [EC used to compile info on faculty, research groups, etc.. CSA is doing some related compilations now. US UCAR does this regularly.]
- Canadian Universities need to find resources to compile this information and keep it updated.
- *This undertaking requires clear goals, efficiency, ongoing commitment, and resources.*
- *We recommend a periodic survey of all university research groups active in ARR.*

ARRCU Survey Ideas

- Self-identify research groups (e.g. department or subgroup)
 - List of research areas/projects.
 - Tabulation of HQP
 - Facilities/infrastructure
 - Funded research (fundamental, applied, GoC, industry, national/international)
 - OrcID or other citation information to link to reference databases.
 - Etc.
- Survey would require review and buy-in from ARRCU community before distribution.
- An initial quick survey would be feasible to do soon, but how would we use the information in the paper?

Quantifying capacity: Key Recommendations

Appendix Material

- Proposed Appendixes:
- A: Current partnership programs – would it be valuable to include this?
- B: List of infrastructure. J. Abbat: *Make sure to point out that there are substantial investments in individual groups as well as in large projects. If only large projects/facilities are mentioned, the impression is given that these are most important.*
- C: International research and infrastructure programs – how exhaustive?
- D: Preliminary survey of capacity.
- E: PARRC Terms of Reference

Introduction/Conclusion Sections

- Introduction – any comments?
- Conclusion:
 - Reiterate key recommendations
 - Outline next steps.

Conclusion

Actions related to paper

- Notes from the meeting will be shared.
- Feb. 3 is comment deadline for Draft 1
- AGP committee will meet tomorrow morning to follow up.
- We will work on a next draft by Feb. 24 (partly depends on comments received and on whether we want to include survey results).
- We will ask people to sign off and seek institutional support in some form.
- Dissemination: ARRCU website, professional society bulletins (CMOS etc.),
- Propose that Figure 1 (if it is kept) and Appendices and Tables could be updated even after the paper is posted.

Immediate actions/unresolved points of discussion (10 min)

- Open discussion

ARRCU Moving Forward

- Next step is focus paper on academic-industry partnerships (AIP) – February-August 2017.
 - ARRCU-WG should strike separate committee.
 - Replicate the AGP approach: draft outline, video conference to discuss, face to face workshop, final draft.
- Subsequent step: focus paper on education/training. May-September 2017. As in previous examples.

ARRCU Moving Forward

- Should we have an additional focus paper on the role of and support for *fundamental* research in ARR?
 - With our partnership and education papers we could be better positioned to argue that support for fundamental research in our domains is vital?
 - Such research is also carried out by colleagues across government and industry but is in the mainstream of academic research.