Briefing Document
Institute of Space and Atmospheric Studies
A Research Unit within Department of Physics and Engineering Physics
University of Saskatchewan
www.artsandscience.usask.ca/physics/isas
2012/13

Updates Alan Manson ISAS Exec-Sec
E.g. Items may be new or gone
Nov 22, 2012
Institute of Space and Atmospheric Studies (ISAS)

Providing National and International Leadership in Research

“Atmospheric Environment” ¹
- Atmospheric Processes: radiation, chemistry, dynamics, global coupling
- “Climate Change”: Anthropogenic and Solar Forcings

“Space Environment” ²
- Solar-Terrestrial Coupling Magnetosphere-Ionosphere
- Geospace Knowledge: “Space Weather” “Space Climate”

Programs guided by CSA Workshops/Events of 2005-12: Reports;
- “10 Year Outlook for Solar Terrestrial & Atmospheric Sciences” [~2008]

Professors
2. George Sofko [E] Sasha Koustov Glenn Hussey Kathryn McWilliams
1 & 2 Jean-Pierre St.-Maurice CRC
ISAS Community

Activities guided by:

MISSION STATEMENT

♦ Research Local/Regional National /Continental Global/Planetary
♦ Knowledge Understanding Technology (“hard” “soft”)
♦ Training Students PDF/Scientists Engineers Collaborative
♦ Technology Transfer People Ideas CSA-contracts/-Space Technology
♦ Communications Papers [peer review] CSA/NRCan/EC Media Community
♦ Linkages Collaborations CSA-SS EC-AS&T EC-MSC GSC-NRCan NSERC

ADVISORY COMMITTEE

♦ Govt Agencies and Depts, Local Space Industry, UofS Admin
• **Space Environment / Solar-Terrestrial Science**

**Ionosphere-Thermosphere-Magnetosphere**

- Solar variability and solar wind
- Magnetospheric responses and processes, space plasmas
- Linkages with the ionosphere and thermosphere: ionospheric velocity and electric field patterns, voltage maps, aurora

**Geospace Monitoring**

- *Ground-based observations* full temporal resolution networks
- *Space-based observations* full global coverage limited temporal resolution
- *Models, data assimilation*

**Space Weather and Climate:** Influences upon space vehicles; communications and remote sensing; ground-based energy distribution systems; solar influences upon climate; presence in the Arctic
Atmospheric Environment/Science

Lower and Middle Atmosphere (2-100km)

• Global distributions of Green Houses Gases (GHG) eg. ozone, minor constituents, and aerosols
• Sources and sinks of atmospheric constituents: chemical, thermal and dynamical processes
• Dynamical processes: winds and planetary, gravity and tidal waves
• Linkages between chemistry and dynamics; Teleconnection-processes

Observations Monitoring

• Ground-based observations full temporal resolution networks
• Space-based observations full global coverage limited temporal resolution
• Models, data assimilation

Atmospheric Processes of Climate and its Change:
changes to biosphere, urban and agricultural environments; anthropogenic effects; solar forcings; Canadian Arctic [presence and environment]
ISAS Resources: 1. Personnel

6 Professors ¹ - Principal Investigators + 3 Research Professors (Emeritus)
2 Adjunct Professors
9 Research Staff: 4 Research Associates and 5 Research Engineers
6 PhD Graduate Students
5 MSc Graduate Students

ISAS Support Staff

Bill Marshall  
Technician: optics /electronics lab. supervision, system/site maintenance, system development

Cindy Jelinski  
Clerical: personnel, web manager, text-graphics, communications…Plus
Admin: stores, accounts, space, conferences

¹ Including CRC Chair in “Environmental Sciences”; not including salary-line for Prof Manson
PEP-ISAS Resources: 2. Professors
3 Emeritus 2 “senior” 2 “middle-”, 2 “early-career”

* Expertise match PEP undergraduate needs
  - Engineering Physics
  - Honours (Math- Physics, Comp- Physics )

* Research themes match Canadian priorities
  - CSA/EC/NRCan/CRC-gone $ bridging opportunities

* Research activities match Graduate Student & Career Development Needs
  - Information Technology and Telecommunications
  - Space Research / Technology
  - Environmental Science / Technology

Strong Professorial strength in ISAS is appropriate
ISAS Resources: 3. Systems

A. Existing

General Equipment (test, laboratory) $290K
VHF radar (Sapphire) $500K
HF radar (SuperDARN) $1200K
SuperDARN (PolarDARN) [Geospace Monitoring] CFI $1200K
Network for Northern Studies (CANDAC-PEARL) CFI $8M+
MF radar systems (4) plus Eureka-Meteor Radar $1200K
Odin-OSIRIS Satellite $25M+
Computer systems (incl. work stations) $300K

Total $4690K+$M

NB Other infrastructure Odin software systems: 2013
$2000K invested (CSA contracts)

B. Future (will appear in NSERC grant applications, or within CSA programs)

- Second generation “OSIRIS” systems $M
- Atmospheric Sciences Global Change Missions $M
- Upgrade to ISAS test equipment $50K

Total $M
ISAS  Resources: 4.  Infrastructure

- **Development Laboratories**
  - Field Sites
    - Park Site (MF radar); Kernen (SuperDARN radar); Physics Roof (Optical); Bakker’s Farm (VHF radar); Rabbit Lake (Optical); Platteville, Colorado (MF radar); Tromsø, Norway (MF radar); Prince George BC (PolarDARN); Rankin In. & Clyde River, Nunavut (2 PolarDARN); CANDAC-PEARL (SKiYMET radar), Eureka, Ellesmere Is
  - Computers
    - PC Workstations (HP-C200, -7151; IBM; OSIRIS-systems), Alpha-server 1000, SuperDARN Data-Copy Centre
  - Support Staff
    - Administration
    - Finances
    - Stores
    - Technical

1. NSERC  2. CSA  3. Uof S  4. CFI  5. RISR-C
### ISAS Resources: 5. 2011/12 Grants / Contracts/CRC/In Kind: UofS

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<th>Source</th>
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NSERC (Natural Sciences and Engineering Research Council)

- Provides a variety of Programmatic/Grant-like opportunities... beyond DG Grants, scientific-goals, methodology, now set by Federal Govt in concert with any existing Govt Agencies/Depts.
- Collaborations with the CSA no longer evident to University Communities

CSA (Canadian Space Agency)

- Provides a modest variety of contract and grant-like opportunities: System-Studies; Suborbital systems/studies; ISR (US-Canada) Radar; Modest systems on International Missions; Climate Processes Missions. Interactions with Universities modest; but effective with Mission-Groups. CSA events [information, discussion] for University-, Space Company- and Govt- scientists/engineers are provided. Budget for CSA is modest and less than community capability.
- Some of above resulted from Advisory Committee (1990-2007) recommendations and interactions (community workshops) between CSA Staff and University/Industry Professors, Scientists & Engineers.
ISAS Research: Future Systems/Programs
Profs inputs...Nov 19 2012

ATMOSPHERIC Chemistry Dynamics Thermodynamics Pollution

- MOPITT campaigns / ground-based OSIRIS^2^, 2006-13
- CMAM atmospheric model, DAS^2^,^3^,^4^,^5^ (data assimilation, modeling) limited.
- Chinook SWIFT-ARGO Mission^2^ Possible Delayed
- Canada’s Contribution to SCOSTEP’s CAWSES (Climate And Weather of Sun-Earth System) II [2009 – 2013+2] and CEDAR^2^ Profs with NSERC-DG
- “Polar Environment Atmospheric Research Lab”^6^,^5^,^2^,^3^,^4^, CANDAC at Eureka, 80N, with SKIYMET VHF radar 2006-13, Hemispheric collaborations/CCAR?
- **STEP-APOCC** (Atmospheric Processes of Climate and its Change, 2006-15)^4^,^2^,^5^,^3^ Mission Concept Study^7^,^8^ 2008/9 Possible Joint Missions Delays

^2^ NSERC ^3^ EC (AS&T & MSC) ^4^ CSA ^5^ CFCAS-Gone 2012 ^6^ CFI
^7^ GSC-NRCan ^8^ Bristol Aerospace other Companies

Cont’d.
ISAS Research Futures (Continued)

AHM+ KMcW comments…Nov 19 2012

GEOSPACE Ionosphere Magnetosphere Aurorae Solar Processes

• **SuperDARN operation and growth** 2, 4, 6 2006-13
• GeoSpace Monitoring/ SuperDARN (+PolarDARN) 6, 4, 2, 7 / CADI 2, 4 1999 – 2012 [Dec]
• **Operations of “RISR-C” at Resolute Bay** 2, 4, 6 2010-2014
• CSA e-POP satellite 4, 2 2006-14
• ESA-SWARM 4
• THEMIS (gb CSA) Kuafu ‘ORBITALS’ 4, 2 2012 No $ “New Management”
• ILWS Program **unknown**

2 NSERC  3 EC (AS&T)  4 CSA  6 CFI+Sask  7 NRCan
Challenges and Opportunities for 2012-2013

- **Enrich and expand scope of “Solar Terrestrial and Atmospheric Science” Research (ISAS)**
  
  - Department, College and University levels; inherent multi-/inter-disciplinarity
  - Engagement with the SENS and GIWS; Global Change…
  - Agency linkages: CSA EC[MSC-AS&T] NRCan-GSC CRC-gone Defence R&D
  - Linkages with Canadian Universities, Communities and Space-Industries

- **Optimize activities with CRC Chair:** “Solar-Terrestrial Environment”; “Atmospheric Environment”; Environmental Research within UofS, GIWS and SENS.
  
  - “Space Weather” and “Processes of Climate and its Change”
  - Links with Biology, Geological Sciences, Geography, Agriculture, Engineering
  
- **Professors, the heart of ISAS**
  
  - Hire an Atmospheric Science Professor ~2016 [no salary line for Prof Manson]
  - Consistency with Department (Physics and Engineering Physics) and College.

- **Response to Serendipity** Cont…but some trends are not good
Appendix 1    ISAS Resources  (Summary)

Personnel  33: 6 (+1) Professors, 3 Emeritus/ISAS Research Professors, 2 Adjuncts, 9 RA/Res. Engineers, 11 Grad Students, 2 Support-Staff

Systems    Radars (MF, HF, VHF, UHF)    Odin-OSIRIS Satellite
            Optical-systems (ground, atmosphere)    Computers
            SuperDARN, PolarDARN, SKiYMET, RISR $4700K+M

Infrastructure Field sites: Saskatchewan, Canada, International Development Laboratories
                        Computer-systems

Financial   $ 2.36 M  2011/12    NSERC, CSA, UofS Grants/Contracts
            $ 2.18 M  2012/13