Community Radiative Transfer Model Working Group (CWG) Meeting Summary

World Weather Building – Room 712
January 30, 2008

Attendees:

JCSDA Director:
Lars Peter Riishojgaard, JCSDA

CWG Technical and Management Oversight:
Fuzhong Weng, NESDIS/STAR

CWG Co-chairs:
Yong Han, NESDIS/STAR
Paul van Delst, SAIC

CWG Core Members:
Ben Ruston, NRL
Zhiquan Liu, NCAR/AFWA
Emily Liu, NASA/GMAO
Dan Birkenheuer, OAR
Ye Hong, Aerospace (not present)

CWG Collaborating Members:
Ping Yang, Texas A&M
Ralf Bennarts, Univ. Wisconsin
Jean-Luc Moncet, AER
Quanhua (Mark) Liu, Perot Systems
Yong Chen, CIRA
David Groff, SAIC
Banghua Yan, Perot Systems
Ron Vogel, IMSG
Min-Jeong Kim, CIRA

I. Welcome & Opening Remarks (Fuzhong Weng)

- This CRTM Working Group (CWG) is the result of an action from the November 2007 JCSDA MOB meeting.
- CRTM is a very important and highly visible project for JCSDA. CRTM capability is being extended by usage in NWP, algorithm development, and future instrument requirements analysis. As a result we need better communication with members of the broader community. Management will listen to your feedback and requirements.
- Is it necessary to have someone present in CWG from NCEP reanalysis project? First-line users should be present: Jim Jung, Min-Jeong Kim.

II. CRTM Status (Paul van Delst)

- It would be better to have developers interact more with JCSDA core team rather than just delivering code.
- Status:
    - AtmAbsorption: CompactOPTRAN, others are currently being considered for implementation
    - AtmScatter: includes cloud & aerosol scattering
    - SfcOptics: have received input from many sources (IR, MW / water, land, snow, ice)
    - RTSolution: ADA, also plan to implement SOI
- Framework:
    - RT problem split into components. Independent development is possible; modules are added to the framework with a minimum of development.
    - However, developers don't adhere to guidelines.
    - JCSDA core team doesn't have the resources to do all the implementation and testing required.
    - JCSDA core team should provide more and better instruction to developers.
- Available documentation:
    - Coding Guidelines
    - Code Review & Acceptance Guidelines (DRAFT)

      ACTION: All CWG members provide feedback to Paul. Anything to add in terms of code review and criteria?
    - Developer Interface Specification (still needed)
- Provide access to CRTM code base
    - Difficult for those outside of network to access code repository.
    - Discussion:

      LPR: Is lack of access a technical problem?

      PVD: Partly technical, but also due to security requirements. Mirror is available for some internal developers.

      LPR: Can the public access the code?

      PVD: Yes, software is on an FTP site.
- Better communication/direction for developers needs to be provided by JCSDA core team. Input from CWG is needed.
    - Discussion:

      LPR: CRTM is a victim of its own success. We need to keep building on that success. Constituency is growing.

      PVD: The team needs understanding of the processes to get things done, set priorities.

      LPR: Yong Han and Paul van Delst, as CWG chairs, now share responsibility for setting up the procedures for communication.
- CRTM Requirements
    - Developers should adhere to coding guidelines and coding review acceptance, although criteria are difficult to quantify. Need guidance on how to accept code from developers.

- Hold regular code review meetings: design of code, let developers know usefulness of their work
- Discussion:
  LPR: Are you proposing a review board?
  PVD: This could be an iterative and informal process through CWG.

- CRTM Testing
  - Need test cases to catch breakages: smoke test, unit test, regression test.
  - Reason for testing is to find problems before CRTM is delivered to NWP models – prevent breakage in NWP model.
  - Paul is looking into build process to do automatic testing.
  - Discussion
    DB: Some suggestions: have a parallel system for testing.
    Testing/compiling should be conducted on multiple platforms
    PVD: Does his own testing with 4 compilers on Linux. No longer testing SGI or Sun platforms. Computers can be donated by others to allow more extensive testing: Builds should be done every night with automatic testing.
    LPR: agreed that systems are heterogeneous and platform testing is needed.
- CRTM Repository
  - Located inside EMC firewall. Access determined by project leader.
  - Those outside network do not have access
  - Need communication to know who's working on what to prevent conflicts when committing new code.
  - Future: Need an offsite repository with SCM tool (Trac), backups, ftp server
  - Discussion:
    LPR: UKMO may provide insight on security/access issues because they deal with multiple developers/users across multiple organizations and countries.
    LPR: How to pay for an offsite server?
    PVD: Yes, it will cost money for set-up, server maintenance, etc.
    QL: Can EMC reduce security restrictions?
    PVD: Steve Lord tried to push this but NCO has greater security restrictions.

III. CRTM Ongoing and Planned Development (Yong Han)

- Ongoing Projects within JCSDA core team (not externally funded projects)
  - SSU transmittance model with CO2 cell pressure correction.
    Will be integrated into operational CRTM.
    In use by NCEP reanalysis and NASA GMAO.
  - Improvements to CompactOPTRAN.
    Includes best from OPTRANv7, SARTA, RTTOV.
  - Implement multiple transmittance algorithms (SARTA, RTTOV, OPTRANv7)
  - Implement Zeeman effect in fast radiative transfer model (AMSU-A, SSMIS)
    Takes the Earth's magnetic field effect on channel radiance into account

- Investigate new IR surface emissivity model from NRL.
  Comparison of CRTM (current & NRL emissivity models) with AVHRR. NRL model shows some improvement in wintertime. NRL model uses climatological as well as real-time inputs, but does not include directional effects on emissivity.
- Implement new low-frequency MW sea surface emissivity model
  New model improves bias at high wind speed
- Improve ADA radiative transfer solver computational efficiency
  Cloud radiances require more computation to consider multiple scattering, but user requires fast speed. Significant improvement is possible.
- CRTM test and validation work are ongoing
- Discussion:
  LPR: What about IASI? CrIS?
  YH: IASI is done. Requires only assimilation testing at this point.
  PVD: CrIS will be worked on very soon. Need input from instrument scientists.
  BY: What about the new snow MW emissivity model?
  PVD: New snow emissivity is not in current release, but will be implemented in next release. Developers should do the integration themselves.
  RB: OSS requires changes to framework. How will SARTA be merged?
  PVD: Yong Chen has proposed a redesign for merging SARTA.
  CompactOptran is coupled with AtmAbsorption. Needs to be decoupled to implement other transmissivity models.

- Planned Development
  - Implement SOI radiative transfer solver from U. Wisconsin. Y. Tahara will implement on visit from JMA. Quanhua Liu has initially implemented SOI in CRTM.
  - Implement AER generalized OSS algorithm
    Accuracy is good compared to OPTRANv7
    Include principle component (PC) methodology
    Will result in structural changes
    Manpower is needed to do implementation

IV. Open Discussion

- Roles of CWG participants. What role can CWG participants play?
  PVD: CWG members should state their expectations for CRTM.
  FW: CRTM should leverage resources by working with community members.
  YH: CWG should decide CRTM development priorities.
  ZL: NCAR is a user of CRTM. NCAR wants to be involved in testing prior to releases. WRF-Var radiance assimilation update: (1) RTTOV8.7 and CRTM1.1 in WRF 3DVAR/4DVAR, (2) initial cloudy radiance assimilation implementation and (3) both for research community and operation at AFWA.
  PY: Is there an FTP site to upload deliverables?

ACTION: PVD will see if FTP upload is currently available through EMC

PY: How does Texas A&M contribute its IR RTM?

PVD: To contribute code, make your code available for review. Developer make test cases. Prior to coding, have a design review to make sure code will work with CRTM framework. Design of CRTM not set in stone. Framework can be changed if change is significant enough.

ZL: There is no good JCSDA website link to CRTM.

FW: Lori Brown is STAR webmaster and will contribute some time to set up CRTM site.

ACTION: PVD will contact Lori Brown to set up CRTM website on JCSDA webspace.

QL: Website is urgent to disseminate CRTM information, especially to CWG.

- Repository access: outside server

  FW: UMD was contacted to provide a server but is worried about responsibility. Buying machine is not problem – IT service is problematic. Not much better than NOAA in terms of access to the outside. NCAR Development & Testbed Center (DTC) for WRF access is also a possibility. NCAR has experience.

  ZL: DTC maintains WRF and GSI. NCAR has other possibilities also.

  ACTION: FW will continue discussion with UMD.

  ACTION: PVD contact will contact DTC.

- Navy update on CRTM usage (Ben Ruston)

  RTTOV in 3DVAR, CRTM in 4DVAR.

  Navy will put RTTOV in 4DVAR and compare with CRTM.

  Uses PC method in CRTM

  FW: JCSDA will listen to Navy requirements. Please share results.

- NCAR concern over antenna temperature correction

  ZL: Where is brightness temperature conversion needed?

  QL: NOAA-15 through 17 AMSU has brightness temperature in BUFR data. NOAA-18 and Metop have antenna temperature. Convert brightness temperature to antenna temperature.

  FW: Conversion is from Tsan Mo. Has been implemented in CRTM. This needs to be addressed by data handling group and made clear for users.

V. Future CWG Meeting Schedule

- It was decided that CWG meetings would be held every 3 months.
- Fuzhong Weng suggested the following agenda for future meetings:

  Check actions from the last meeting

  Discuss new business

  Each partner gives a 5 minute update on their CRTM testing/analysis

  Discuss new requirements: Who will develop? Implement?

VI. Adjourn

Action Item Summary:

1. All CWG members provide feedback to Paul van Delst on Code Review & Acceptance Guidelines draft document. Anything to add in terms of code review and acceptance criteria?
2. Paul van Delst will see if FTP upload is currently available through EMC (for code submission).
3. Paul van Delst will contact Lori Brown (STAR) to set up CRTM website on JCSDA webspace.
4. Outside server for repository access: Fuzhong Weng will continue discussion with UMD. Paul van Delst will contact NCAR/DTC.