



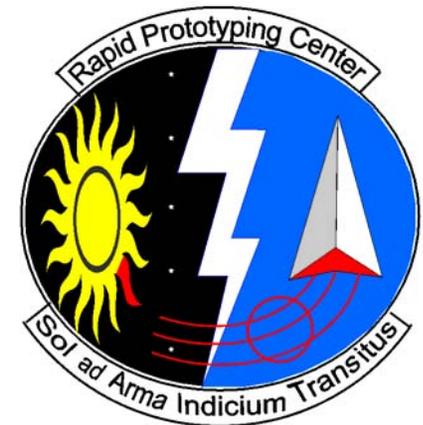
# CCMC Workshop

11-14 Oct, 2005



## Operations & Education Support Session

### How Can CCMC Help AFSPC: Innovative Ideas



**Thursday Morning**

**Stephen Quigley**

**AFRL/VSBX at SMC/WXTG**



# AFSPC Ops – CCMC Help & Innovative Ideas

## Main Problems



- **Main problems with Research to Ops Funnel (aka Valley of Critical Care)**
  - **RPC or Ops not ready**
    - But process proved
  - **\$**
    - **Recommend CCMC staff forgo salaries for 1-10 yrs and funnel that money to SMC/WXT and/or AFWA/SWOC for model integration into ops**



# AFSPC Ops – CCMC Help & Innovative Ideas

## Previously Noted Recommendations



- **CCMC Help to AFSPC - Previously Noted Recommendations**
  - **Help our community settle on model interfaces**
  - **Help dev a program to determine/apply input data and model error bars**
  - **CCMC ops & validations will deal solely with env models, not SI products**
  - **Consider comparative validation of USU & USC GAIM models**
  - **Consider current SI product inputs for some model output metrics:**
    - **Solar radio background & burst freqs, start/max/end time, fluxes**
    - **Aurora location & intensities**
    - **Sub-auroral polarization stream (SAPS) location & intensities**
    - **Ionospheric scintillation zones locations & intensities**
    - **Magnetosphere particle (electrons & GCRs) location & intensities**
    - **Ionospheric electron content location & intensities**
    - **SAA particle content location & intensities**
    - **Meteors location & flux**



# AFSPC Ops – CCMC Help & Innovative Ideas

## Additional Recommendation – Error Bars



- **CCMC Help to AFSPC - Additional Recommendations**
  - **Multiple runs of single model based on error bars**
    - **If only have input data error bars, consider triple model runs based on error bars**
      - Max error-low run
      - Ave/median error run
  - **Is an alternative to Ensemble model use?**
  - **Grid/resolution will be important variable wrt model output error bars**



# AFSPC Ops – CCMC Help & Innovative Ideas

## Additional Recommendations – Model Comparisons



- **CCMC Help to AFSPC - Additional Recommendations**
  - **Comparative validation of current ops-used baseline models (often empirical) to those considered potential replacements**
    - **Auroral/Polar Boundaries & Intensities**
      - Hardy/Ovation vs Bats-R-Us & Raeder
    - **SAPS Boundaries & Intensities**
      - Foster vs Goldstein/Burch/Sandel models
    - **PRISM to GAIMs ?**
  - **Comparative validation of same-purpose current ops-used baseline models at the various ops sites (AFWA, SEC, NASA)**
    - **Proton event models**
    - **Shock propagation models**



# AFSPC Ops – CCMC Help & Innovative Ideas

## Additional Recommendations – Model Comparisons



- **CCMC Help to AFSPC - Additional Recommendations**
  - Find/select/run/validate any solar xray event and/or radio burst forecast model
  - Consider Space Environment Technologies (SET) xray event initiation-forecast model (Tobiska/Bauer)



Note: Recommendations made do not consider desire of model developers



# AFSPC Ops – CCMC Help & Innovative Ideas

## Additional Recommendation – Data Types



- **CCMC Help to AFSPC - Additional Recommendations**
  - **Consider comparative validation/runoff for given model(s) with different input data types to show what (if any) value is added by driving ops models with other types of data**
    - “DoD-owned (allowable) data
    - Best available other data



# AFSPC Ops – CCMC Help & Innovative Ideas

## Additional Recommendation - Nukes



- **Nuclear Effects Incorporated**
  - **Current system-impact products lack nuclear detonation effective environments/effects, so we're initiating the incorporation of such effects.**
  - **Three options for incorporation of nuke effects:**
    - **Adjust current/upcoming env models used in the system-impact products, or**
    - **Use DTRA's ISM model specifically designed with nuclear effects built-in, or**
    - **Use a combination of the two options**
  - **Either way, the addition of DTRA's ISM to be run/validated at the CCMC is recommended, with comparisons between it, Raeders and Bats-R-Us**
    - **Include use of each with solar wind and a proxy driver**



# AFSPC Ops – CCMC Help & Innovative Ideas

## Additional Recommendation – Data Fusion



- **CCMC Help to AFSPC**
  - Prepare for future use of Data Fusion
    - **SMC is investing in Data Fusion as the future of space weather ops products**
      - All system measurables/mnemonics
        - Satellite telemetry/ephemeris data, etc
      - **System As a Sensor (SAS) as another source of input data, and as a dynamic calibrator for the env models and system impact products**