TAC

Range-Velocity Ambiguity Mitigation

Status Briefing

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RV Mitigation Status

- Background
  - MOU History
  - RV Mitigation Workshop
- Present Status
  - MOU Present Status
  - Technical Requirements
  - ROC Present Status
  - Issues/Risks
- Schedule
- Future Work
- Summary

MOU History

- 1994
  - OSF Engineering enters into MOU with FSL to address data quality optimization, emphasizing AP mitigation
- 1996
  - OSF Applications established MOU with NCAR and NSSL to research RV mitigation
- 1997
  - First phase coded data set collected at KOUN

MOU History, cont'd

- 1998
  - MOUs combined under OSF Engineering control
  - Program focuses on SZ phase coding and staggered PRT
    - Code developed to separate 1st and 2nd trip echoes
    - SZ (8/64) demonstrated to increase area of unambiguous coverage
- 2000-2001
  - Two scans at lower elevations proposed
- March 2001
  - TAC Sponsored Workshop on Range Velocity Dealiasing Held

TAC Workshop Recommendations

- Workshop addressed two approaches
  - Multiple PRF Dealiasing Algorithm (MPDA)
  - Open RDA options (Phase coding and Multiple PRT)
- MPDA is a useful capability that needs to be very aggressive at achieving a near term:
  - Operational demonstration and,
  - Quantitative performance assessment
- Both phase coding and multiple PRT offer significant advantages over MPDA and, can achieve an operational demonstration much more quickly by using COTS processors to acquire test data

TAC Workshop

- MPDA seen as interim solution
  - Operationally demonstrated at Kessler AFB
  - Implemented in Build 5 with VCP 121
- ORDA Solution will replace MPDA

TAC Workshop ORDA Recommended Milestones

• SZ phase coding running on RVP7 at KOUN	May 01
• Dual PRF running on RVP7 at KOUN	Jun 01
• Staggered PRT running at KOUN	Mar 02
• Case studies, algorithm refinement, validation,time series data recording	May 01-Ongoing
• 3 radar functional comparative evaluation	Mar-Aug 02
• ORDA prototype implementation	Nov 02
• Operational demonstration	Mar 03

Will show updated chart in summary

MOU Present Status
FY-03 SOW Tasks

- Collected phase-coded time series data
- Validated censoring methodologies for phase coded data
- Quantified performance of RV Algorithms
- Prepared for full implementation of RV Mitigation algorithm on Open RDA
- Implemented S-Pol RVP8 and RV mitigation algorithm for validation tests

MOU Present Status (Cont)
FY 03 SOW Deliverables

- Joint Report – August 2003
  - Contained Detailed Algorithm Descriptions
  - Contained Selected Case Studies
  - Recommended modified VCP 11
    - SZ-2 at lower two elevations elevations
    - SZ-1 at elevations up to 16.7 deg.
- Final NSSL Report – October 2003
  - Contained SZ-2 Algorithm
- Final NCAR Report – December 2003
  - Contained SZ-1 Algorithm

MOU Present Status (Cont)
FY-04 SOW Tasks

- Analyze SZ-2 for Clutter Filtering and Censoring
- Support Implementation of RV Mitigation Algorithm (SZ-2)
- Compare SIGMET SZ-1 with NCAR/NSSL SZ-1
- Continue Development of Staggered PRT and SZ-1
- Explore Phase Coding for Dual Pol

MOU Present Status (Cont)
FY-04 SOW Deliverables

- RV Algorithm Modification report – Jun 2004
- Staggered PRT Algorithm – Aug 2004
- Report on SZ-1 Comparison Study – Sept 2004
- FY 2004 Final Report – Nov 2004

Technical Requirements

- Strong and weak trips
  - Weather targets within the unambiguous range are considered in “trip 1”
  - Weather targets beyond the unambiguous range are considered in “trip 2”
  - Usually, trip 1 returns are stronger than trip 2, (i.e., greater power) but not always

Technical Requirements, cont'd

- Recover strong trip (Ps) and weak trip (Pw) spectral moments when the power ratio between Ps and Pw is less than or equal to about 40 dB (Ps/Pw <= 40 dB)
- Recover weak trip with a SNR <= 20 dB
- Recover spectral moments when spectral width <= 4-6 m/s

ROC Present Status

- Successfully implemented Prototype SZ-1 as a Major Mode (MM) on the RVP8
- Developed Level One Recording and Playback Capability
- Implemented Prototype SZ-2
  - As described in the NCAR/NSSL SZ Report
  - Data processed with an RVP8 displayed on an RPG
- Began SZ-2 Production Coding

ROC Present Status, cont'd

- Operational Concept TIM held 13 January
- Attendees from ROC (All Branches) and WDTB
- Recommendations
  - Treat SZ-2 as a new range unfolding technique
  - Minimize operator intervention
  - Possible VCP
    - Retain surveillance cut at lower two elevations
    - Replace doppler cut at lower elevations with SZ-2

Issues/Risks

- Clutter
  - Legacy Clutter Filter is not Compatible with SZ Phase Coding Technique
    - Creates an inconsistent phase bias
    - GMAP Filter appears to solve this problem
  - Handling clutter beyond first trip
    - NCAR and NSSL Report due June 15
- Frequent SIGMET Code Updates

Schedule

- Completed SZ-1 Prototype September 2003
- Completed SZ-2 Prototype February 2004
- Began SZ-2 Production Code March 2004
- Receive Censoring and Clutter Filtering Recommendation June 2004
- Incorporate Censoring and Clutter Filtering in Production Code by December 2004
- Field SZ-2 in Build 8 upon TAC and SREC Endorsement
  - Submit to integration test team January, 2005

Future MOU Work

- FY04 – Develop SZ-2 Operational Code
- FY05 – Develop SZ-1/Staggered PRT
- Analyze S-Pol Data
- Modify Algorithms for Dual-Pol
- Validate Algorithm Modifications
- Develop Operational Code
- Test Dual-Pol RV Algorithms Field

Summary, Recommended Milestones

- SZ phase coding running on RVP7 at KOUN — May 01
  - Completed August 01
- Dual PRF running on RVP7 at KOUN — Jun 01
  - RVP 7 not configured to run Dual PRF
- Staggered PRT running at KOUN — Mar 02
  - Jan 2003
- Case studies, algorithm refinement, validation,time series data recording — May 01-Ongoing
  - FY 03 and FY 04 SOWs
  - L1RP Developed in FY03

Summary (cont)
Recommended Milestones

- 3 radar functional comparative evaluation — Mar-Aug 02
  - Have compared KOUN to KTLX in FY-03
- ORDA prototype implementation — Nov 02
  - SZ-1 Prototyped in RVP 8 in Sept 03
  - SZ-2 Prototyped in RVP 8 in Feb 04
- Operational demonstration — Mar 03
  - Awaiting ORDA

Conclusion

Based upon this briefing and the briefings from NSSL and NCAR, request a TAC endorsement to proceed with implementation of SZ-2