Site Description: Boulder, Colorado

Map showing locations of Table Mtn, BAO, Marshall, and Stapleton.
Marshall Field Site (NCAR)

Programs

- NOAA H$_2$O & O$_3$ balloon soundings (since 1980)
- Plate Boundary Observatory (GPS)
- NCAR winter weather experimental site
- Test site for various NCAR/EOL instruments

Instruments

- NOAA FPH and ECC w/ Vaisala radiosondes
- Ground-based GPS receiver
- Surface meteorology & hydro-met sensors
- Towers, wind profilers, S-Pol radar & others
Table Mountain and BAO (NOAA)

**Programs**
- Baseline Surface Radiation Network (BSRN) sites
- In situ trace gas profiles (22, 100, 300 magl)
- Meteorology (10, 100, 300 magl)

**Measurements**
- All GRUAN surface radiation variables
- CO₂ & CO (BAO)
- T, RH, Winds, P_surface (BAO)
Priority 1 & 2 Requirements:

1/week: production radiosonde w/ best currently available technology

1/month radiosonde w/ H₂O

00/12 LST production radiosonde w/ best currently available technology

Priority 2 Measurements

Benefit from other programs

Status & Needs

• Weekly RS80H & O₃ sonde
  • RS92 (will require ground station from NCAR)

• 2/month RS80H & FPH & O₃ or CFH
  • 1/month also has GPS

• S-MkIIA NWS Stapleton (00/12 Z)
  • Proximity? (29 km from Marshall)
  • Vaisala RS92 (?)

• Two fully-instrumented BSRN sites at TM & BAO (~20 km)
  • 1/week O₃ sondes

• GPS Observatory (Marshall) w/ UCAR/COSMIC & NCAR/EOL
  • Radiometrics MWRP at BAO
Instrument & Measurement Considerations

Current radiosondes with H₂O and O₃ soundings at Marshall (RS80H) and at the NWS Stapleton site (S-MkIIA) are not the “best technology available”

Only ~25% of Marshall balloon payloads carry GPS

No ground-truthing of RS80H immediately before launch at Marshall (Tap into year-round surface met data at the WWE site or install our own met sensors ?)

TM, BAO, and NWS Stapleton sites are not co-located with the Marshall site. How representative are they of Marshall?

NWS launches at 00/12 Z instead of 00/12 LST (Δ=5-6 hr)
Switching to RS92 will require a ~$50K ground station … 
and a met sensor package for ground-truthing

NCAR GAUS (GPS Advanced Upper-air Sounding) system
RS92SGP radiosonde compatible, all digital radiosonde
Measurement Guidelines/Manuals

- Informal, in-house documentation outlines pre-launch instrument preparation, launch & post-flight data procedures.
- Consistency in personnel & prep/launch/data procedures to maintain stability of long-term measurement program
- Can produce more formal documentation if necessary

Data dissemination practices

- Currently on request and/or anonymous ftp
- Work on posting in a more visible location (ESRL/GMD website)
- 2009 goal: submit O$_3$ and H$_2$O profile data to NDACC
Needs from the Lead Centre / working group / secretariat

• Help addressing instrument & measurement concerns
  - changeover to RS92 (NWS?)
  - more frequent GPS w/ radiosonde

• Possible assistance in putting data in GRUAN format
  (whatever that might end up being)

Scientific / organizational developments

• Improving collaboration between NCAR and NOAA
  (e.g., NCAR GAUS system for Marshall will require significant
  cost sharing for labor, maintenance and future upgrades)

• NCAR is working on developing a balloon-borne TDL for H$_2$O
Questions?

The Rocky Mountains from 30 km altitude
Future: Balloon Borne TDL (Tunable-Diode Laser) Hygrometer

940 nm  
Paige, JOAT 22, 1219-1224 (2005)

1854 nm (under development, SWS/EOL)

- Accuracy 2.5%, Precision 1.0%
- Noise levels (1 sec)
  Altitude  Low  High
  2 mb  0.9 mb
  (-72 C)  (-77 C)
- 2 m optical path
- 500 – 750 mW power consumption
- 230 g weight (with batteries)

From Mark Paige