BOUNDARIES/CI GROUP BREAK-OUT MEETING NOTES AT IHOP-2002 MEETING (APRIL 2001)

Editors: Conrad Ziegler and David Kingsmill

(updated 5-30-01)

* LARGE-SCALE EFFECTS ON BOUNDARIES & CI
- Treat using local soundings, profilers, & operational model output
- Synoptic scale influences
- Vertical deep tropospheric effects

* CONSIDERATIONS FOR MOBILE AIR/GROUND-BASED OPERATIONS
- refer to updated diagram "IHOP_mobile.land.pdf"
- Domain: south (Red River); east (central OK); west (central TX Panhandle)
- Extend domain northward into south-central KS
- Identify ground-based mobile base of operations
- Boundary speed ideally < 5 m/s: quasi-stationary is best
- Types of slow-moving or stationary boundaries in target region during May-June:
    - drylines
    - stationary synoptic fronts
    - decayed (not actively forced) thunderstorm outflows
- Upper limit boundary speed in range of 5-10 m/s (mobile data collection prohibitive)
- Concentrate ground-based mobile observations within an "Intensive Observing Region" (IOR) along target boundaries to determine relevant finescale BL structure (refer to diagram "IHOP_CI.plan_inner.pdf")
- Aircraft traverses help locate boundaries
    - early (fine-tune target)
    - during data collection (updated boundary location)
- Real-time CAPPI display of ELDORA on P-3 (high priority)
- Secondary boundaries/CI. Target cumulus-free boundary. Then developing cloud lines in vicinity? "Tilted boundaries" toward cool side of boundary/internal boundary layer.
- Long (~ 80 km) P-3 legs along boundary.
- "Box" or "T" mobile ground-based cm-wavelength mobile, scanning Doppler radar arrangements favored. E.g. refer to "IHOP_CI.plan_outer_box.pdf" and "IHOP_CI.plan_outer_tform.pdf" for "box" and "T" radar arrangements respectively.

- Radar/other deployment pattern fit to actual conditions in field (including roads)
- Period of Sampling
    - afternoon boundaries (1400 LT to 2000 LT)
    - insufficient capability for other periods (eg. nocturnal elevated convection)
- Decide on tentative target, then refine (i.e. make small adjustments to) target in transit
- Fine-tune target in field based on actual road availability
- Coordinate mobile sounding locations based on availability/separation of dropsondes

* NEED TO COORDINATE SOME DEPLOYMENTS WITH ABL GROUP
- Process of identifying ABL group needs that mobile observations can help address
- Need to devise sampling strategy for "quiescent" BL sampling with mobile sensors
- Targetable non-classical boundaries or features:
    - horizontal convective roll (HCR)
    - open cellular convection (OCC)
    - strong horizontal gradients of surface flux/vegetation/soil moisture
    - topographic ridges
- Phenomena that could be explored in detail:
    - evolution of mesoscale ABL structure (i.e. daytime diurnal cycle)
    - conditions and processes for forming & maintaining HCRs & OCC
    - forcing convergence bands/OCC/HCR by topography & heat flux gradients

* REMOTE BASE SITE FOR MOBILE OPERATIONS
- Mobile facilities could be split between bases in Norman and a remote site
- Possible remote sites discussed: Woodward, OK.
- Expense of support
- Communications with IHOP Control for briefing, during field ops, and for SPC forecaster debriefing on following day
- Coordinating forecast/targeting decision prior to deployment is a problem

* COORDINATION OF MOBILE FACILITIES
- Field Coordinator (FC)
- IHOP Control (IC)
- Mix of responsibilities of FC and IC for coordinating mobile facilities
- P-3 needs to set up its legs. This is mainly a problem to be solved by the P-3 and other local mobile field facilities, which are sensing the local fine-mesoscale weather conditions of interest. ELDORA CAPPI display capability is needed for P-3.
- Information from FC and IC can be factored by P-3 Chief Scientist into P-3 flight plan.

* AIRCRAFT RESOURCES
- 15 boundaries/CI missions are planned
- NRL P-3, UWKA, dropsonde aircraft, and DLR Falcon support requested to complement ground-based mobile facilities on as many missions as possible
- Nominally ~ 7 hr per mission flown (includes ~ 1-2 hr two-way ferry from base to target)
- Maximum of 105 flight hours @ 15 missions x 7 hr/mission per a/c

* DROPSONDE AIRCRAFT
- Separate dropsonde aircraft is requested
    - other a/c will be available for only part of IHOP
    - other a/c will be deployed for some other-than-CI objectives
    - dropsonde a/c must not fly too fast -- permit drops at ~ 15 km spacing
- $1500/flight hour + $600/sonde
- 200 drops requested on six (6) missions = ~ 30 drops/mission
- Assuming ~ 7 hr missions, $63 k + $120 k = $183 k
- Intersecting boundaries deployment
    - intersection of dryline and stationary front
    - dropsondes in "L" or "box" pattern oriented parallel & normal to boundaries
- Other deployments indicated on operations diagram

* OVERALL COORDINATION & COMMUNICATIONS
- Nowcasting
    - IHOP Control (IC)
    - PIs in field (based on field data collected by FC)
    - Both IC and FC provide input
    - Final decision on target, period on station, and redeployment/end of operations
- Proximate location of IHOP Control to NCEP/SPC
    - "co-location"? Separate building within walking distance?
    - exchange of forecast and nowcast information
    - debriefing SPC forecasters to communicate field experience
- Pre- or early deployment of some platforms
    - a/c, MM detect boundary location during late morning or early afternoon
    - thin line development in WSR-88D
    - "coverage holes" in WSR-88D are problematic for nowcasting thin lines
    - could pre-deploy DOW to target region for local-scale "surveillance"

* GUIDELINES FOR PRIORITIZING BOUNDARIES/CI FACILITIES USE

- "1" highest, derived by averaging ranking (1-2-3) assigned by each PI
- First seven (rounded to nearest 0.1)
    P-3 with ELDORA/DIAL (1.0)
    DOWs (1.6)
    NSSL M-CLASS, NCAR M-GLASS (1.7)
    GPS dropsondes (1.9)
    digital photography/photogrammetry (1.9)
    UWKA with WCR (2.2)
    DLR Falcon with downward DIAL (2.7)

* IMPORTANT CONSIDERATIONS FOR RANKING FACILITIES:
- High weight for mobile in-situ water vapor data through the BL on a range of fine spatial scales. E.g. Used for water vapor mixing ratio field analysis. *High priority* application to validate airborne DIAL on NRL P-3.
- In-situ water vapor measurements provided by:
    UAV
    MM
    M-GLASS, M-CLASS
    Dropsonde
    MIPS
    P-3
    UWKA
- Need for a *lot* of redundant extended volume coverage, multiple Doppler airflow data through the BL. One or more individual radars might be inoperative or otherwise unavailable at any given time. Ground-based radars have much higher time resolution than airborne radars. Radars providing this extended volume Doppler coverage:
    P-3
    DOWs
    SMART-radars
- Other Doppler radars providing very important independent Doppler data in 2-D:
    U-MASS mm-wave
    WCR

* FINAL RANKING FOR FACILITIES (BOUNDARIES/CI FOCUS)
Level 1:
    NRL P-3 with ELDORA and sideways-pointing Leandre II and TDL
    200 Dropsondes from dedicated aircraft
    UWKA with WCR and TDL

Ground-based mobile radars
NCAR MGLASS
NSSL MCLASS

Level 2:

DLR Falcon with downward-pointing DIAL
MIPS
UAVs
Mobile Mesonet

Level 3:

Mobile Radiometer
Ground-based DIAL
Scanning Raman lidar
S-Pol
ISS/MAPR
TAOS
SABL
ISFF
FM/CW radar