

IHOP Surface Data Workshop Discussion Summary

SYNOPTIC DATA (for model input)

- Radiosonde data – want available at highest vertical resolution possible and at the usual 5-mb interval (JOSS will produce 5-mb data)
- Wind-profiler data
- IHOP data-assimilation products?

RAINFALL DATA

- Rainfall (Standard rainfall product will be used for Chen’s HRLDAS, but higher resolution data useful for flight tracks, watershed studies, and a 7-10 day period selected for CRM or MM5 runs).
 - Ed Brandes – for Walnut River Watershed
 - Hatim Sharif – for selected days.

SURFACE FLUX STATION DATA

- Atmospheric Data
 - Corrected tower data (H, LE, precip, rad. etc) Correction (sonic tilt, Krypton cleanup, soil moisture). Post-calibration underway at NCAR
 - ISFF available by 1 October (Horst)
 - Station 10 available by? (Alfieri)
 - 30-min gap-filled fluxes (Niyogi will check AmeriFlux gap-filling strategies)
 - Merged flux dataset in uniform format that includes ISFF, CU, OASIS, ARM, AmeriFlux (password-protected for subsets). JOSS will obtain ARM flux data from ANL. (who obtains other datasets?)
 - Analysis of evaporation components (direct evaporation and transpiration) – Niyogi (special product)
- In-Situ (flux tower) Soil Data
 - Sites 1-9 Post-calibration (underway, ISFF and Cuenca + others at NCAR available ?)
 - Soil physical properties
 - Available From Richard Cuenca 31 August
 - Soil density (urgently needed for use of gravimetric samples).
 - Soil texture (“primary” variable – rely more on this one compared to hydraulic conductivity.
 - Soil temperature
 - Hydraulic conductivity – what do do if the hydraulic conductivity modeled
 - doesn’t match the measurements?
 - Matric potential

- Volumetric soil moisture
 - Other soil physical properties
 - Macropores in soil – Cuenca tried to account for this.
 - Thermal conductivity: do we have enough data to back this out? Diak will ask John Norman.
 - Field Capacity and Wilting Point
 - Soil carbon flux (how to handle? – Ken and Dev – use FIFE as guidance?)
- Roughness length and Displacement Height (momentum, scalars). Sensitive to small errors in data. Can estimate for vegetation type? Function of time (wheat harvest). Veg height was measured as a function of time.
- Emissivity (tables, based on vegetation and soil?)

OTHER SURFACE DATA NEEDED

- Vegetation Physical/chemical Characteristics (Niyogi)
 - Fractional Coverage
 - Greenness fraction (U Kans) Diak will find out) – **kars** data (from satellite)
 - Root zone (clues: notes of root locations when install soil sensors; deduce from behavior of soil profiles, plant height, look at data on plants)
 - C3 versus C4
 - Minimum stomatal resistance
 - Plant height
- Land Use
 - 1-km EROS/USGS land use maps
 - 1-km MODIS landuse types
- Lakes (for flight tracks, can see in aircraft video)
- Irrigation? (obtain center-pivot locations from states? Kansas has)

GAP data

- Albedo
- Soil Texture – where to obtain information?
 - STATSGO soil texture
 - 1-km PSU
 - higher resolution GIS
- Higher-resolution data needs (order 100 m or less)
 - For comparison of surface variables to flight tracks
 - For fiddling with LSMs along flight tracks
 - DEM at 30 m
 - From: Counties, Landsat (see below)

DATA FROM OTHER FLUX STATIONS

- Merged flux dataset in uniform format that includes ISFF, CU, OASIS, ARM, AmeriFlux (password-protected for subsets). JOSS will obtain ARM flux data from ANL. (who obtains other datasets?)
- What soil-moisture information is accessible?
- Is there photographic documentation for these stations?

KING AIR DATA

- Raw data: available from <http://flight.uwyo.edu/ihop02/data>
- King-Air flight-leg and sounding times – Peggy
- King Air Mission summary table (Peggy will complete)
- King-Air fluxes
 - King-air horizontal flux variability at 200' – 1-km avgs plus 5-km averages centered so that legs can be averaged.
 - LeMone – using CASES-97 techniques
 - Davis/LeMone – try shorter-wavelength component
 - Full multiplied spatial series as Function of time, height, and Pressure, PALT (PI)?
- Average flight-level data
 - Winds are eliminated by models. (useful?)
 - Soundings with location, pressure and altitude (could be sent over to JOSS and put in standard CLASS format). Try to remove wind bias (ask Wyoming first). Question: what sort of averaging is needed so that winds are representative? Just provide soundings and let modelers worry about it?
 - Land use (crops, lakes, irrigation, etc.) from videos (PI). Results from this exercise should be shared with group.
 - Wyoming Cloud Radar data. (Bart Geerts is a good contact).

SATELLITE (Diak, Mecikalski will organize with input from Grossman, notes)

- AVHRR, GOES, MODIS products, at 0.5-1 km resolution
 - For period of IHOP
 - MODIS home page at NASA/DAC (cost?)
- Insolation can do hourly (can download daily off Web) for LSM input
 - Can be obtained from Wayne Feltz – downwelling long and short-wave radiation, surface- characterization products, surface temperatures (Tarpley's group from NESDIS makes available).
- 20-km resolution solar and long-wave downward from GOES and NOAA
- cloud product; PAR for LSM input
 - How: Diak and Mecikalski (Is this overlap with previous item?)
- Radiative surface temperature for model input, Grossman BFA work
 - Weekly values from IHOP o.k
 - Note this is a function of viewing angle.
- Fractional vegetative cover f(NDVI) from AVHRR, MODIS
 - Diak has 2-wk NDVI composites
- NDVI to estimate greenness fraction, etc.
 - When: Samples during IHOP
- What: Landsat for higher-resolution surface characterization for aircraft-model flux comparison along flight tracks. Grossman BFA work, possibly CI work.

- Inner IHOP Domain highest priority, especially around KA flight tracks.
- When available over IHOP domain during IHOP (want to enlarge the time envelope?)
- How: Diak will look up whether the skies are clear for overpass times and get back to JOSS). NOTE: Michigan State has an archive of several images.
- Satellite-Derived Sensible and latent heat based on ALEXI for comparison with other fluxes, use in models.
 - Only where skies are clear.
 - During IHOP

PHOTOGRAPHS AND NOTES FOR SURFACE STATIONS

- Fei Chen has collected photographic documentation of 10 surface stations from several people; will get them organized on his web sites, and then burn CDs. JOSS will have link to the web site
- Dev Niyogi, Heather McIntyre, and Joe Alfieri are developing a photographically-based surface characterization of each site listing the dominant species, vegetative fraction, and other characteristics.
- Peggy LeMone will provide her photographs taken along the flight tracks to be scanned for the Fei Chen Web site.
- King-Air videos: Available through JOSS.

OTHER ITEMS

- **Determine “Golden Days”**
 - For LSM evaluation
 - Clear skies optimum, light winds desirable.
 - King Air flying over surface stations desirable
 - Interesting heterogeneity?
 - Convection “golden period.” Relevant because:
 - HRLDAS might be run for selected period for this
 - Want to relate BL processes to convective initiation and evolution.
- **Determine needed Land-Surface Models input in addition to measured fluxes:**
 - Vegetation and soil: Dev will revise the list of inputs based on model type (make a table of variables, and where to get them), starting with lists above.
 - Rainfall (Standard rainfall product will be used for Chen’s HRLDAS, but higher resolution data useful for flight tracks, watershed studies, and a 7-10 day period selected for CRM or MM5 runs).
 - Ed Brandes – for Walnut River Watershed
 - Hatim Sharif – for selected days.
 - Dev Niyogi wants to test different parameterizations based on “light use efficiency” (ratio of carbon uptake to available light, function of plant type). For carbon uptake, ET. Need wind speed, lapse rate, brightness temperature.

- **Evaluations and Comparisons**
 - NDVI from multiple sources (aircraft, surface, satellite) – find out wavelengths used.
 - Porometer measurements
 - Soil moisture
 - “Surface” (5-7.5 cm) – ATD, us (two techniques), TRIME, soil cores.
 - Root zone estimates
 - NDVI-LAI-Green vegetation fraction estimates using different satellites and techniques.
 - Radiometric Surface Temperature
 - Variability on transects (specify coefficient variation)
 - Sensitivity of models to variability (i.e., What heterogeneity is relevant?)
 - Lidar boundary-layer depth vs depth estimates from King Air (Davis)
 - Eddy Fluxes to compare:
 - LSMs -- Surface eddy-correlation – Aircraft -- Satellite
 - King/Air Falcon
 - Satellite flux estimates
 - Radiation Fluxes to Compare:
 - Downwelling long and short wave radiation from GOES, aircraft, surface
 - Flux stations
 - PAR from GOES product, flux stations.

- **Scaling from leaf to field to IHOP data**
- **Communication of results of Workshop:**
 - Distribute these notes for PIs for comment
 - Let NSF know about what is going on between groups. (Fei and Peggy will write up notes).
 - Summarize surface-heterogeneity dataset for invited BAMS hydrology article.

Appendix:
Workshop Agenda: IHOP Surface, Soil, and Vegetation Workshop
Foothills Lab Building 3: Room 1067

Objectives

1. Update availability, accessibility, and quality of surface, aircraft, and sounding data from IHOP
2. Assess user requirements for those data
3. Assess possibilities for obtaining data needed for modeling but not measured
4. Explore collaborative effort for future data development and research efforts

Each presentation is about 10-20 minute followed by a 10-min discussion. We encourage speakers to talk about the timeline of data processing, possible correction applied to raw data, and their research plan.

Monday, 5 August, 2002

8:30-12:35 Session 1: Surface/soil data

8:30 Welcome (Roy Rasmussen)

8:35 Objectives of the workshop (Peggy LeMone, NCAR)

8:40 Overview of IHOP (Tammy Weckwerth, NCAR)

9:10 Motivation for the Surface/soil/vegetation network (Fei Chen, NCAR)

9:30 NCAR Surface flux network (Tom Horst, NCAR)

10:00 Coffee Break

10:30 Surface characteristics of CU Station 10 (Joe Alfieri and Peter Blanken, CU)

11:00 Analysis of profile soil measurements Richard Cuenca, Oregon State)

11:30 Transpiration/ stomatal resistance feedback for improved synthesis of land atmosphere interactions during IHOP (Dev Niyogi, NCSU)

12:00 Discussion: User requirement and quality control issues for surface data

12:30-1:30 Lunch

1:30 Session 2. Aircraft and Upper Air measurement

1:30 IHOP Boundary Layer mission (Peggy LeMone, NCAR)

2:00 First impressions from aircraft data (Bob Grossman, CoRa)

2:30 Evidence of surface influence on BL horizontal heterogeneity from King Air data (Peggy LeMone, NCAR)

3:00 Overview of Radiosonde and Dropsonde Data during IHOP (Junhong Wang, NCAR)

3:30 Coffee Break

4:00 Satellite Data and Satellite-Based estimates of Land Surface Radiative and Turbulent fluxes for IHOP (George Diak, U Wisconsin)

4:30 Discussion: User requirement for aircraft and sounding data, satellite data, and data quality control issues

5:30 Reception (FL cafeteria)

Tuesday, 6 August, 2002

8:30 - Session 3: Other data sets

8:30 Radar-based rainfall maps for major events during IHOP (Ed Brandes, NCAR)

9:00 Vegetation characteristics for IHOP stations (Dave Yates, NCAR)

9:30 Soil moisture and temperature analysis for the SGP area (Fei Chen, NCAR)

10:00 Coffee break

11:00 IHOP PBL heterogeneity study (Dave Stauffer, Penn State)

11:30 S-Pol data from IHOP (rainfall, refractivity, etc.)
Rita Roberts (NCAR)

12:00 Lunch

1:30 IHOP data archive at JOSS Steve Williams (NCAR)

2:00 Discussion: data distribution and use policy, collaborations

3:00 Coffee Break

3:30 Discussion: comparisons of measurements from different sensors, value-added data needs for modelers, model products helpful for data analysis, use of MODIS data

4:30 Workshop adjourns

6:00 Dinner (Mesa Cafeteria)