Automated hot spot and smoke detections will be provided by the Automated Biomass Burning Algorithm (ABBA) and the Fire Identification, Mapping and Monitoring Algorithm (FIMMA), developed by NESDIS' Office of Research and Applications (ORA). Smoke trajectories will be calculated by the HYbrid Single-Particle Lagrangian Integrated Trajectory Model (HYSPLIT), developed by NOAA's Air Resources Laboratory. Satellite imagery and model outputs will be displayable as multiple data layers in the HMS updated half hourly, and analysts will generate a composite image and graphic product disseminated on the Internet. The product will be geolocated and be compatible for display by commonly used Geographic Information Systems. Users will be able to choose geographic areas displayed.

An operational demonstration is scheduled for early Summer, 2001, with subsequent further development, including the possible incorporation of data from the NASA's MODIS instrument and satellite derived vegetation index and fire potential maps.

B41C-10 1105h

Methods based on remote sensing data for environmental monitoring to support National and Regional Protection Agencies

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Remote sensing provides useful data for environmental monitoring nevertheless, efforts are required to test and evaluate methods and techniques to be applied for operational applications.

Since 1994, in the context of several projects founded by the Italian Environment Protection Agency (ANPA) and Environmental Department of Basilicata Region, we have experienced the use of remote sensing for environmental monitoring in operative contexts. Particularly, we have developed and tested methodologies based on the integration of remote sensed data aimed at: estimations of space/temporal dynamics of surface parameters (such as temperature and vegetation indexes), forest fire detection and danger estimation, risk assessment, change detection, desertification, alpine ice monitoring, etc. Some examples are briefly summarized below.

The action C of Timoran projects was devoted to forest fire monitoring. We devised a dynamic short time fire forecasting based on the integration of remote sensing and GIS. A daily fire susceptibility assessment was performed, from NOAA-AVHRR exploiting the cross analysis of the temporal evolution of NDVI and the middle-infrared channel. Four danger classes have been obtained (low, moderate, high and very high). We also estimated the expected fire severity combining and integrating different danger variables, such as: (1) fire susceptibility (water stress) performed using satellite AVHRR data, (2) fuel type, (3) incidence of topography, (4) wind forecast, obtained from meteorological models. Potential and limitations of AVHRR for fire detection were evaluated in the Italian ecosystems. At present we are working on evaluating the effectiveness of Landsat-TM imagery for mapping burned area in heterogeneous regions, characterized by different cover types, rough topography and complex ecosystems.

In the context of "Devising of environmental indicators based on remote sensing data" project, funded by ANPA, we investigated on an AVHRR time series from 1985 to 2000 to perform change detection analysis and to monitor desertification process in the Italian peninsula. First at all, we quantified the systematic errors due to satellite orbit drift and calibration residual of short-wave channels. After the accurate removal of distortions, performed at the pixel level, we applied a number of change detection analyses based on NDVI (Normalized Difference Vegetation Index). Results and performances of the different methods were evaluated by comparisons with ground data in selected test areas. Finally we defined a change detection indicator based on the inter-annual MVC (Maximum Value Composite)-NDVI behavior expressed as percentage variation and computed pixel by pixel. At present we are experiencing the reliably of the indicator performing further investigation at a higher spatial (Landsat-TM, SAR, field surveys) resolution in areas classified as more vulnerable from the AVHRR-based analysis.

We also developed procedure based on GIS in order to integrate data banks, gathering and elaborating the information coming from different sources and to perform a ready update of data and models.

B41C-11 1120h

Use of Space Technology in Flood Mitigation (Western Province, Zambia)

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Disasters, by definition are events that appear suddenly and with little warning. They are usually short lived, with extreme events bringing death, injury and destruction of buildings and communications. Their aftermath can be as damaging as their physical effects through destruction of sanitation and water supplies, destruction of housing and breakdown of transport for food, temporary shelter and emergency services.

Since floods are one of the natural disasters which endanger both life and property, it becomes vital to know its extents and where the hazards exists. Flood disasters manifest natural processes on a larger scale and information provided by Remote Sensing is a most appropriate input to analysis of actual events and investigations of potential risks. An analytical and qualitative image processing and interpretation of Remotely Sensed data as well as other data such as rainfall, population, settlements not to mention but a few should be used to derive good mitigation strategies. Since mitigation is the cornerstone of emergency management, it therefore becomes a sustained action that will reduce or eliminate long term risks to people and property from natural hazards such as floods and their effects. This will definitely involve keeping of homes and other sensitive structures away from flood plains. Promotion of sound land use planning based on this known hazard, "FLOODS" is one such form of mitigation that can be applied in flood affected areas within flood plain. Therefore future mitigation technologies and procedures should increasingly be based on the use of flood extent information provided by Remote Sensing Satellites like the NOAA AVHRR as well as information on the designated flood hazard and risk areas.

B42A CC: 310 Thursday 1330h

CO2 Flux Measurements from the Ground Up II *(joint with A, GS)*

Presiding: **S Frolking**, Univ. of New Hampshire; **P Crill**, Univ. of New Hampshire

B42A-01 1330h INVITED

Estimating Uncertainty of Ground-based Estimates of Net Ecosystem Production: An Example Using an Old-growth Ecosystem

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Understanding the rate forest ecosystems exchange CO_2 with the atmosphere is a critical step in managing the carbon cycle. Unfortunately this exchange is difficult to estimate and contains numerous uncertainties, the bounds of which are rarely stated. Flux-tower based measurements provide spatial integration and high temporal resolution. Ground-based measurements are complementary in that they allow examination of specific mechanisms and spatial heterogeneity. Making these estimates, however, requires the combination many sub ecosystem-level fluxes from disparate processes and pools each with a different uncertainty term. To circumvent this problem, Monte Carlo methods were used to estimate the uncertainty in estimates of pool stores, net primary production (NPP), heterotrophic respiration (R_h), and net ecosystem production (NEP). Long-term measurements of tree growth and mortality, litterfall, short-term direct measurements of respiration, and long-term estimates of decomposition rates were coupled with data on detritus and soil stores from an old-growth forest at Wind River Experimental Forest, Washington to illustrate this methodology. The range of uncertainty of estimates is reported as the mean ± 2 standard errors of the mean. Total carbon stores at the site were estimated to be 615 Mg C ha^{-1} (range=581 to 647 Mg C ha^{-1}). Total NPP, including grazing and deducting for heart rot losses was estimated to be 5.58 Mg C ha^{-1} year^{-1}, with a range of 5.14 to 6.02 Mg C ha^{-1} year^{-1}. R_h, including the respiration of grazers was estimated to be 5.39 Mg C ha^{-1} year^{-1} with a range of 4.63 to 6.15 Mg C ha^{-1} year^{-1}. Combining the NPP and Rh estimates indicates that over the long-term NEP at the old-growth is +0.19 Mg C ha^{-1} year^{-1} with a range of -0.67 to +1.05 Mg C ha^{-1} year^{-1}. This indicates the stand might be a small sink if heart rots are not too extensive in the stand. This estimate contrasts with the 1.9 to 2.2 Mg C ha^{-1} year^{-1} sink calculated at the same site using eddy flux tower methods. Several hypotheses might explain this discrepancy including: 1) undetected biomass increases, 2) underestimates of NPP in the form of grazing, 3) undetected and large losses via dissolved organic carbon, 4) a temporal mismatch between the long-term ground-based versus short-term flux tower measurements, and 5) an underestimate of ecosystem respiration by the flux tower system. The latter two hypotheses appear to be most likely and therefore warrant additional attention.

B42A-02 1350h INVITED

Net Ecosystem Exchange in a Tall Tower Footprint: Reconciling Observations, Modeling, and Remote Sensing

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In this study we investigate the controls on monthly-to-interannual terrestrial NEP within the footprint of the WLEF tall tower. This footprint is large enough (>1 km^2) to be considered as a single example of a global ecosystem model or global remote sensing grid cell. We compare the observed NEE from 1997-1999 with predictions of the Biome-BGC model and attempt to associate discrepancies with specific processes, including plant phenology and soil respiration. The remote sensing observations are used in this exercise to help diagnose interannual variability in growing season length and to characterize the distribution of landcover within the footprint. We consider also inherent limitations in the data, especially the uncertainty associated with data gap-filling methods.

B42A-03 1410h INVITED

Scaling carbon dynamics: models for synthesis and prediction

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Carbon stocks and fluxes vary at a wide range of spatial and temporal scales. The empirical challenge of making measurements across these scales is being met with a range of creative approaches. As more measurements from different locations, at different times, and at different scales are made, the challenge of interpreting these measurements in a consistent framework grows. New ecosystem models that explicitly address issues of scaling may help with the synthesis, and provide tools for making projections into the future. At the same time, by explicitly scaling they are open to testing and parameterization with more data from more scales than ever before. Here I will discuss several important issues related to the challenges of scaling and interpreting of carbon flux measurements, and provide an overview of a new ecosystem model designed to addresses some of these issues, the Ecosystem Demography Model (ED).

2001 Spring Meeting

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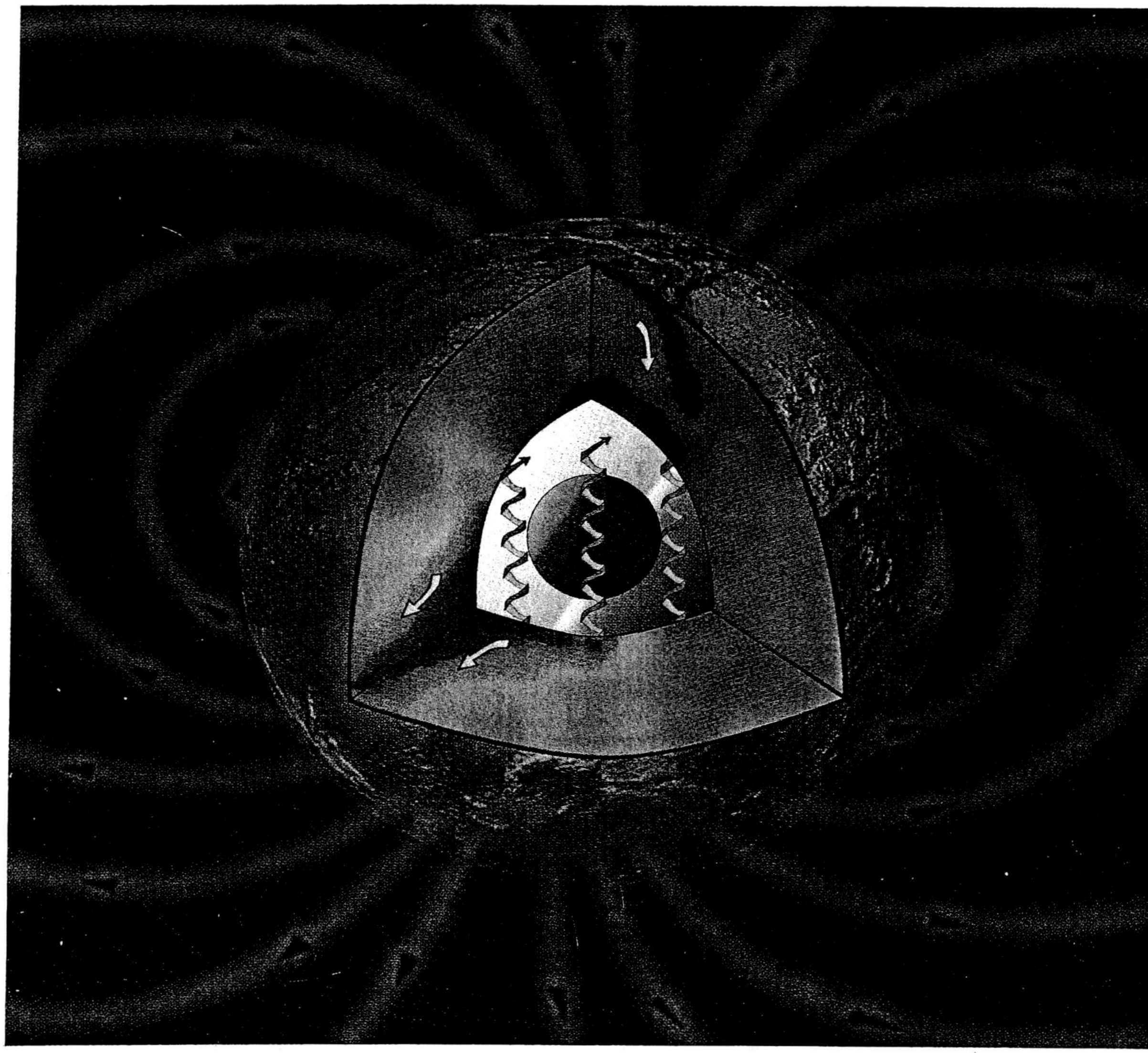

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