Jefferson County Department of Health, Birmingham, AL

ANNUAL PROGRESS REPORT (EMPACT-Birmingham)

Period Covered by the Report: Calender Year 2001

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Title : **Providing Timely Public Access to Daily Air Quality Information about Birmingham AL and Its Regional Environment**

Institutions : Jefferson County Department of Health (JCDH)
Alabama Department of Environmental Management (ADEM)
University of Alabama in Huntsville (UAH)
MCNC-Environmental Modeling Center (MCNC)

Investigators :
JCDH --- Samuel Bell, Randy Dillard
ADEM --- Christopher Howard, Lee Bacon
UAH --- Noor Gillani, Benjie Norris, Arastoo Biazar
MCNC --- John McHenry, Carlie Coats, Jeff Vukovich

Objectives of the Project

The broad objective of this Project is to develop and implement an improved, sustainable and transferrable program of (a) monitoring local air quality, and (b) providing timely and effective public access to useful information about air quality and related meteorology for metro Birmingham and its regional environment (southeastern and eastern USA). The air quality monitoring and public outreach activities and focus are to be expanded in several *major* ways, each constituting a significant innovation in the way local agencies and communities encounter air quality. Our specific objectives and approach are outlined below in the form of specific Project Tasks:

Task 1. Continue the present program of air quality monitoring and public access ;

Task 2. Expand the continuous monitoring program for $PM_{2.5}$, particularly to explore urban-regional exchanges ;

Task 3. Extend program focus from mainly ozone to ozone and $PM_{2.5}$;

Task 4. Extend program focus from local only to local and regional ;

Task 5. Extend forecast modeling capability for meteorology and chemistry, utilizing both upgraded statistical modeling and state-of-the-art real-time 3D Eulerian grid modeling for ozone ;

Task 6. Extend timely and effective public outreach via internet, the news media, and other means ;

Task 7. Provide for local program sustainability and national program transferrability.

Progress/Accomplishments Report (by Task)

Year 1 activities have been mostly of a developmental nature. Focus in Year 2 will shift more to completing the development of the program, to testing its performance, improving it, and documenting/institutionalizing the process for sustainability and national transferability. The emphasis in this section is on the task-by-task outline documentation of what was accomplished in Year 1.

Task 1 : Continuation of pre-existing program.

The pre-existing program of air quality (AQ) management for the Birmingham Ozone Non-attainment Area (BONA) of Jefferson and Shelby Counties (see Fig. 1), consisting of the following, was continued during 2001 :--

- Continuous AQ monitoring --- ozone (9 sites), CO (2 sites), SO_2 and NO_x (1 site), $PM_{2.5}$ (1 site);
- 24-hour average sampling and analysis of $PM_{2.5}$ --- every day (2 sites) and every three days (6 sites);
- Daily ozone forecasting based on statistical modeling using local input variables only;
- Public outreach involving local educational programs and sharing daily ozone forecasts with selected stakeholders.

Task 2 : Expansion of the local continuous monitoring program

Six new continuous monitors of $PM_{2.5}$ were purchased (four with EMPACT funds), tested and installed during the first half of the year, and were in operation from about August 1. Four of them were installed at rural sites in the periphery of the BONA (Pinson, Corner, Providence and McAdory) to capture information about regional inflow/outflow of $PM_{2.5}$ relative to the urban area; the other two were installed at urban-suburban sites (Wylam and Hoover), and complement the one already in existence at the N. Birmingham site. Each of these seven sites now has a Ruprecht & Patashnik Model 1400ab Continuous Particle Analyzer or a TEOM (Tapered Element Oscillating Microbalance) to monitor the particle concentrations, as well as a new ESC Data Logger to transmit the data to the central computer seven times a day (to be increased to hourly in 2002). This represents the best available technology in both continuous fine particle monitoring and data acquisition/storage/software. The central computer subsequently sends the data to the main EMPACT website at UAH at the end of each polling session. Ozone is also monitored continuously at each of the seven continuous $PM_{2.5}$ sites.

A new ozone monitoring site was also added in 2001 at a rural peripheral site in Leeds (Jefferson CO). In addition, a new continuous SO_2 monitor was installed at one of the ozone monitoring sites (Fairfield).

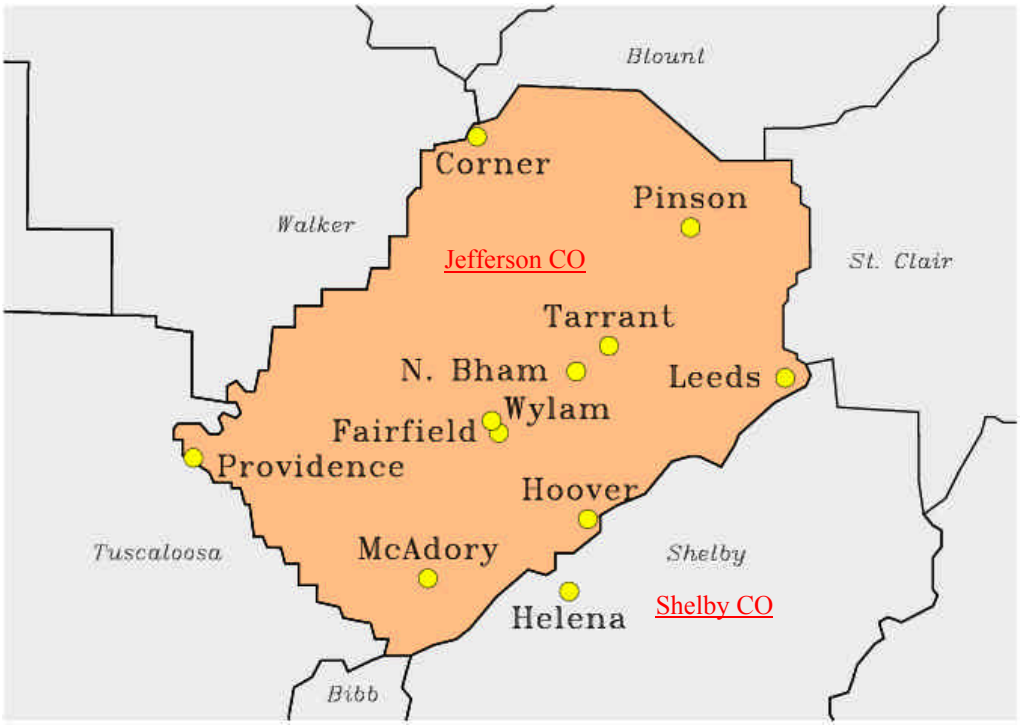

Fig. 1. Map of the Birmingham area showing the local air quality monitoring sites.

Task 3 : Extension of program focus from ozone only to ozone and $PM_{2.5}$

With the installation of the $PM_{2.5}$ continuous monitors at seven of the eleven monitoring sites, in addition to monitoring of ozone at ten sites (all except Wylam), program focus has now definitely been expanded from ozone only to ozone and $PM_{2.5}$. The $PM_{2.5}$ program also includes 24-hour-average filter sampling at eight sites (daily at two sites and every three days at six sites), seven of them co-located with the continuous PM sites (the eighth one at Helena). These samples are routinely analysed for chemical composition. We believe that Birmingham now has one of the best programs in the nation for co-monitoring of ozone and $PM_{2.5}$ in a city in its size category. The increased emphasis on PM2.5 will also occur in our regional program, as part of future activities (Year 2).

Task 4 : Extension of program focus from local only to local and regional

A major new innovation of the Birmingham AQ management program has been the expansion of its focus from local only to local + regional. We have done this in terms of both observational information and modeling information. Observationally, two new elements have been added: (a) the continuous monitoring of both ozone and $PM_{2.5}$ at not only urban-suburban sites, but also at a number of rural sites in the periphery of the BONA (this provides specific information to track regional inflows/outflows of these two secondary pollutants relative to metro

Birmingham, and to distinguish regional impacts locally from local contributions); and, (b) daily tracking of regional (Eastern USA) midday ozone distribution (AIRNOW contour maps) for the past four days, providing a dynamical perspective also of regional ozone pollution. In a similar vein, work is also in progress towards utilizing the objective visibility information (data of light scattering sensors) collected continuously at a large number of sites in the eastern USA (which are part of National Weather Service's ASOS [Automated Surface Observing System] network) to plot daily maps of regional haze, much like the AIRNOW maps of ozone (more on this under the Future Activities section). In addition, we are also generating daily satellite (GOES-8) visible imagery maps of eastern USA as a guide for the dynamics of synoptic scale haze. We plan to connect up all this graphical information of multiday dynamics of regional air pollution through construction of related airmass trajectories. The idea is to maintain on-going visual awareness of the impact of degraded regional air quality on Birmingham.

In addition, we have also successfully implemented a daily local-regional quantitative program of ozone forecasting based on real-time photochemical modeling in forecast mode. This puts the Birmingham AQ management program in a class with few peers (more on this under Task 5). At the same time, we have also continued our daily ozone forecast program based on local statistical modeling.

Task 5 : Extend forecast modeling capability for meteorology and chemistry

Under this Task, we had two main objectives: (a) to upgrade the statistical ozone forecasting by including the role of regional ozone *transport* (by changing the use of today's observed ozone in the statistical formula for predicting tomorrow's peak ozone from the locally-observed value to that observed in the upwind airmass predicted to arrive in Birmingham tomorrow); and, (b) to implement and test the utility of a comprehensive uban-regional photochemical ozone forecast modeling system (including the role of regional ozone *transport and chemistry*) as an additional input to local ozone forecasting. Task (5a) remains to be accomplished during 2002, but we were able to successfully implement Task (5b) --- a Real-Time Ozone Forecast System (RTOFS) based on urban-regional meteorological/ emissions/photochemical modeling, and we are currently in the process of testing its utility in local ozone forecasting. RTOFS and its implementation are briefly described below.

We had five specific objectives under the broader RTOFS objective, as follows:

- Deploy an operational real-time ozone forecast system (RTOFS) using new model grids consistent with local forecaster needs in and near Jefferson County, AL.
- Implement a forecast product delivery mechanism to enable local forecasters to obtain, utilize, and evaluate forecast maps.
- Conduct twice-daily forecast runs of the RTOFS on MCNC host computers.
- Provide MM5 forecast model datasets for input to ADEM statistical forecast modeling.
- Archive model output data and conduct a post-season forecast evaluation to assess performance and to guide improvements.

Of the five specific objectives above, we accomplished the first three in full, and the last one partially; the fourth objective remains to be accomplished during 2002.

The RTOFS core is comprised of three models --- MM5-v3.4 (mesoscale meteorological model), SMOKE-v1.3 (emissions processing/modeling system), and MAQSIP-RT (real-time photochemical forecast model). In the deployment phase, the three models were configured to compute forecasts on new grids consistent with the needs of the Birmingham EMPACT program. The new grids included a 15km-resolution SE US grid and a 5km-scale grid centered on Jefferson County. The last grid scale was chosen as the highest resolution possible for the computational resources available. The MM5 domains were chosen first, and then the SMOKE and MAQSIP-RT domains were chosen as "windowed" portions of the MM5 domain. The MM5 domains are shown in Figure 2, with the outermost domain having a grid resolution of 45km.

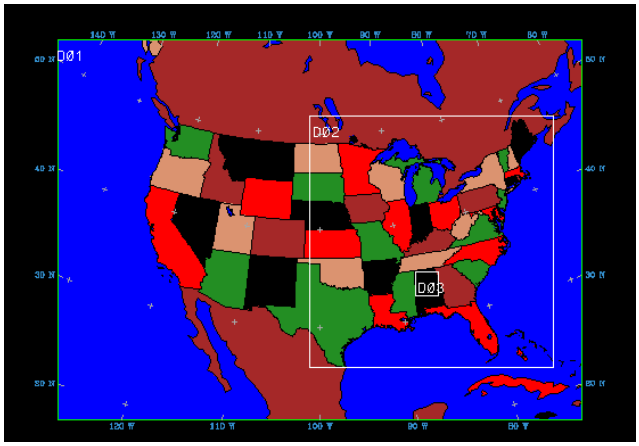

Fig. 2. Map of MM5 modeling domains at resolutions of 45 km (full area), 15 km (eastern USA box) and 5 km (Alabama box).

In addition to the new grids, updates were made to both the emissions inventories and the models used. The EPA NET-99 inventory was used as the basis for computing point, area, and mobile source emissions throughout the SE, including Jefferson County. In addition, biogenic emissions were forecast using the BEIS-3 emissions model. MAQSIP-RT is a photochemical model specifically optimized for real-time forecasting. It is a close "cousin" of EPA's Models-3/CMAQ, the two having been co-developed during the mid-1990's. The primary differences between the real-time, or "RT" version of the model, and the publicly available version of the model include:

- The solver/driver and all sub-modules have been fully optimized for fast performance on scalar/shared-memory computers.
- The full KF (Kain-Fritsch), shallow convection, and resolved cloud chemistry sub-modules are included, and used.
- MAQSIP-RT reads MM5 output files directly written by the MCPL sub-module implemented in MM5, obviating the need for any meteorological data pre-processing.
- The RADM 11-category land-use dry deposition module is incorporated directly.
- A top boundary condition is implemented whereby monthly mean observed 100mb ozone is utilized to simulate stratospheric re-supply of ozone near model top.
- Realistic monthly mean observed ozone sidewall boundary conditions are used on the outer domain.

In order to provide forecast information, a password protected Website (http://emc.mcnc.org/projects/SECMEP/index.html) was developed at MCNC to host both animated and static forecast maps. The primary forecast product was designed to depict both peak 1-hour and peak 8-hour average ozone forecasts at three resolutions: 45km, 15km and 5km. The maps were designed to correspond with the EPA color-differentiated alert codes: green, yellow, orange, red, and purple. The Air Quality Index was calculated from ozone alone and thus a 1:1 color correspondence exists between the AIRNOW and model forecast maps of ozone. An example map of model forecast ozone in the 15-km gridded domain is shown in Figure 3.

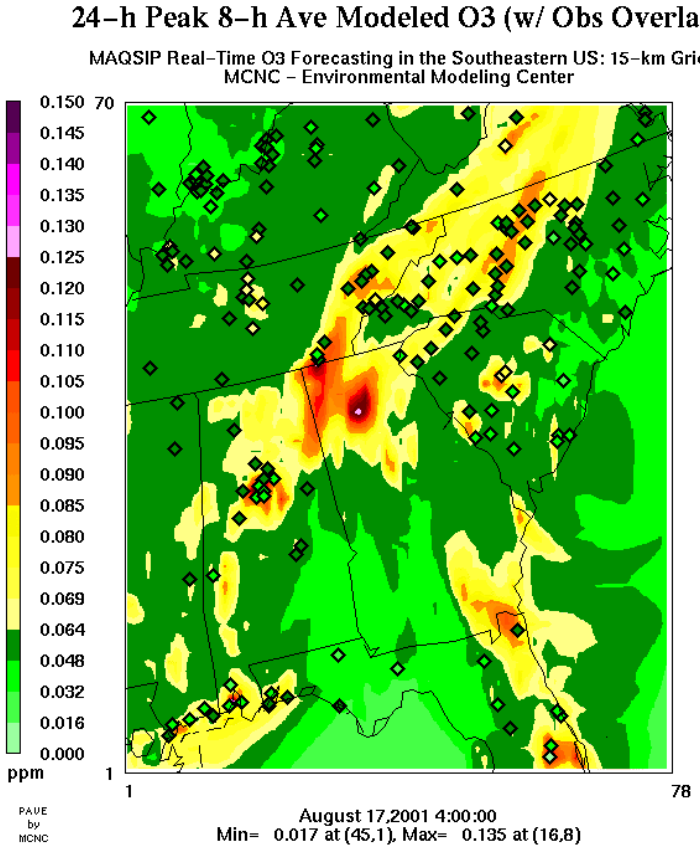

Fig. 3. An example map showing RTOFS forecast ozone on the 15-km resolution grid (◊ = AIRNOW sites)

Actual forecast runs were targeted to begin on July 1, but, due to delays in obtaining upgraded computer resources, actual forecasts began in late July. Forecasts were run twice daily, with the highest resolution (5km) being a same-day forecast available in the early morning hours. Both the 45km (48-hour forecast) and the 15km (24-hour forecast) runs were conducted twice daily, beginning at 00z and 12z respectively. Delivery of the daytime run graphical products was achieved by about 1PM EDT, the production deadline for forecaster usability on the 12z cycle. The 00z forecasts were consistently available by about 3AM.

An FTP gateway was configured at MCNC to allow download of MM5 forecast data for use in a statistical model at ADEM. However, due to workload constraints, this was not activated. We plan to complete this task during 2002.

As noted, production forecasts began in late July. Forecasts were run through the end of October, typically the end of the ozone season in the southern US. All forecast datasets were archived on the MCNC-North Carolina Supercomputing Center Data Migration Facility.

A preliminary evaluation of the forecast results and feedback from the local forecasters at ADEM suggest that RTOFS tended to overpredict local ozone peaks in Birmingham, especially at the lower values of ambient ozone. Work is in progress to determine the possible causes of this systematic high bias.

Task 6 : Public outreach

The main new element in the area of public outreach has been the development of a new website at UAH. Links to the website will be available from the JCDH and ADEM websites. The developmental work is still continuing and the new site will be opened to the public at the beginning of the 2002 ozone season, in fully operational status. Particularly since it is possible for the Birmingham area to be designated in attainment of the 1-hour ozone NAAQS at the end of the 2002 ozone season, an intense public outreach campaign is being planned, to be launched in conjunction with a special media event to promote the Birmingham EMPACT program. We plan to inaugurate the new website at that time.

Figure 4 shows the current form of the home page of the EMPACT-Birmingham website at UAH. In the upper right corner, a button marked "What is EMPACT-Birmingham?" provides a link to general information about our EMPACT program as well as the national EMPACT program. At bottom center, the button marked "What is PPB and AQI?" provides a link to information which explains to lay visitors the meanings of these terms. We also plan to add a similar link to "General educational information about air quality", especially about criteria pollutants including ozone and $PM_{2.5}$, their local as well as regional nature, their health and secondary effects, and the regulatory aspects pertaining to them.

The home page also includes three graphical boxes, the top of which provides access to information of a regional nature, and the two lower ones to information based on local monitoring data. The regional box shows a sample map of the regional distribution of hourly ozone based on photochemical model output, as well as arrows depicting the current surface-level flow field based on MM5 output. There are three buttons on the regional map, marked "Ozone", "$PM_{2.5}$", and "Satellite Imagery". Besides each of the "Ozone" and "$PM_{2.5}$" buttons (which are both inactive), there are two sub-buttons, one colored brown and the other blue. These are intended to be active buttons providing links to additional graphical information. The two ozone buttons have been activated and tested. Upon moving the cursor over to the "Ozone Brown Button", the following message comes up: "Click here for regional daily peak ozone maps of the last four days based on surface monitoring data". Depressing this button brings up a new page showing AIRNOW ozone maps over the eastern USA regional area shown on the home page, based on the peak daily ozone data of each of the last four days. This information is, of course, automatically updated each night. Upon moving the cursor over to the "Ozone Blue Button", the following message comes up: "Click here for map of next day forecast of peak ozone based on photochemical modeling". Depressing this button brings up a new page showing the peak *forecast* ozone regional map for tomorrow based on the latest RTOFS run. This information is also, of course, automatically updated every day. For 2002, we plan to overlay on this forecast map, a 24-hour back trajectory from Birmingham, starting at the time of the local predicted peak ozone, based on forecast transport winds. This will guide the viewer to "see" which airmass from today is likely to arrive in Birmingham tomorrow. For comparison, we also plan to display next to tomorrow's forecast map, the AIRNOW map for today, along with the same 24-hour forecasted back-trajectory from Birmingham. The upwind end-point of the trajectory will show not only the forecasted likely impacting airmass, but also today's peak ozone at that location. In this manner, the viewer should be able to visually assess the nature of regional ozone impact in Birmingham tomorrow.

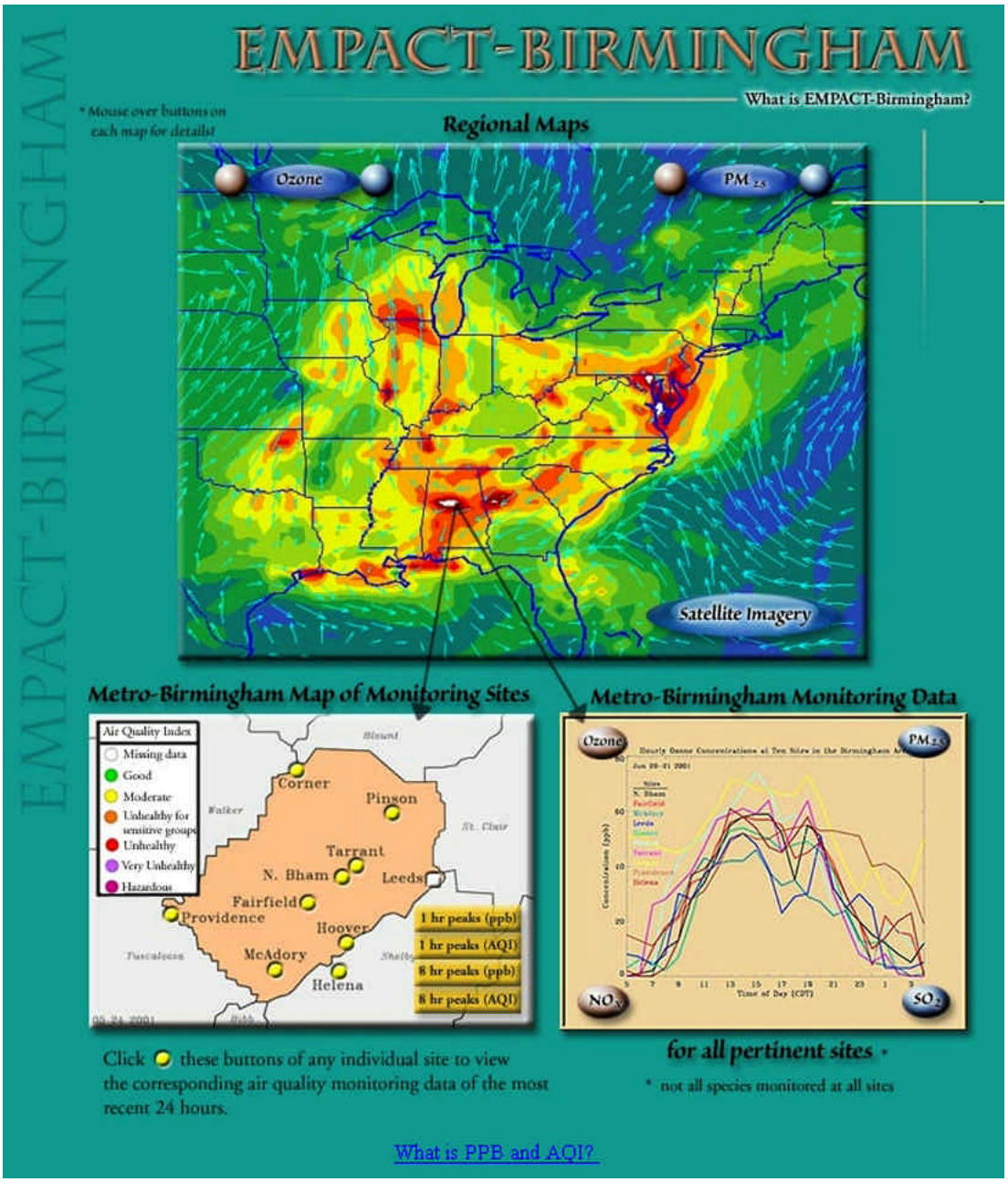

Figure 4. Copy of the Homepage of the EMPACT-Birmingham website.

During 2001, both the brown and the blue $PM_{2.5}$ regional buttons were inactive. The blue button will continue to remain inactive also in 2002, as we do not have plans of forecasting tomorrow's $PM_{2.5}$ based on photochemical aerosol modeling. However, we plan to activate the $PM_{2.5}$ Brown Button, to provide noontime regional contour maps (last four days) of light extinction coefficient as a surrogate for fine aerosol mass, based on the ASOS visibility data. Further information on this will be provided in the Future Activities section. The satellite imagery button is intended to provide link to a mid-day satellite (GOES-8) visible image map of eastern USA as a direct visual guide to the prevailing regional haze situation. Its status is discussed in the text related to Figure 5.

As stated before, the two lower graphics on the home page provide links to *local* monitoring information. The left graphic is a spatial map of the Birmingham area, with a color-coded (based on local ozone AQI) button at the location of each of the local ozone monitoring site (Wylam is missing, because ozone is not monitored there). The

button at the new Leeds site is white, because ozone data from there were not available in 2001. We expect both these sites (Leeds and Wylam) to be activated in 2002, and the buttons will provide links to ozone as well as $PM_{2.5}$ data. The viewer may depress the button over any site to link to a new page, which will provide time series plots of the hourly average data of ozone and $PM_{2.5}$ (where applicable) measured concentrations at the selected site for the most recent 24-hour period. From this page, a link will also be available to a new page containing a photograph of the site and related information about the site. The local spatial map also includes four other yellow rectangular buttons, two for 1-hour peaks of ozone concentration and AQI, and two for 8-hr peaks of ozone concentration and AQI. Depressing the button marked "1-hour peaks (AQI)", for example, takes one to a new page showing the spatial map of the area with a color-coded full circle at each monitoring site, with the color indicating the local ozone AQI category (a legend also shows the color-coded names of each AQI category). The other related buttons provide similar related spatial maps.

The last graphic on the home page, the one at right bottom, facilitates links to time series data on the same plot, for all applicable monitoring sites, for each of four measured variables: Ozone, $PM_{2.5}$, SO_2 and NO_x. There is a brown button at each of the four corners of that graphic, each marked with a name of one of the four species. Depressing the NOx button, for example, will take the viewer to a new page which will show a single time series (for NOx --- Helena is the only site measuring NOx) containing the last 24 hours of hourly data of NOx. If the $PM_{2.5}$ button is depressed instead, seven time series would appear superposed, one for each of the seven sites with continuous data of $PM_{2.5}$. Each time plot is color coded, and a legend provides the association between the color and the corresponding site identification. Each time plot is for the latest 24 hours of hourly data.

Our public outreach program has other elements also. Local media services have been extremely supportive of getting news about air quality to the public (especially noteworthy were *The Birmingham News*, *The Birmingham Post-Herald*, and local television meteorologists from NBC, ABC, and FOX6 affiliates). Stakeholders in the local ozone action program, especially the Alabama Partners for Clean Air (APCA), have also helped to provide "timely public access to air quality information." Educational programs have been numerous and have included outreach programs to approximately forty neighborhood associations, to many public and private schools, as well as colleges and universities (one of the APCA members alone spread the air quality news to 35,000 students), and to many civic-social, business, and environmental groups.

The JCDH began a demonstration outreach project to implement behavioral changes aimed at reducing ground-level ozone and providing a replicable model for other work environments/communities, especially those within the Birmingham ozone nonattainment area (Jefferson and Shelby Counties). The project consists of five components: (1) a scorecard competition, (2) a workshop series, (3) an alternative transportation network, (4) a stay-in-for-lunch program (on ozone action days), and (5) an alternate work schedule program. Records were kept of participants for inclusion in the area's emissions reduction program.

The JCDH was responsible for posting the daily air quality index (AQI), as required by the US EPA. For days reaching code orange (11 days) and code red (1 day), proactive steps were taken to inform the public about unhealthy air quality. The JCDH maintains an ozone hotline to answer questions about air quality and a public recording (updated daily) of the AQI. The Department actively participated as a member of the APCA Steering Committee, Marketing Committee, and Education Committee.

For 2002 the JCDH will work with the other consortium partners associated with this grant commitment to continue the activities summarized above and to expand some outreach activities related to the "deliverables" of this grant, especially the development of the web site. The JCDH will coordinate a special media event to promote this EMPACT project prior to May 1, the beginning date for the 2002 ozone season. Since it is possible for the Birmingham area to be redesignated in attainment of the 1-hour ozone NAAQS at the end of the upcoming ozone season, an intense campaign is being planned.

Task 7 : Program sustainability and national transferrability

In Year 1, the focus was on program development. The task of program sustainability and national transferrability will be tackled in Year 2.

In addition to the above specific Tasks, we also had a task of information management. The status of that task is described briefly below.

Information Management

Figure 5 shows the organizations that participate in the Birmingham-EMPACT project and how the data flow among them was originally envisioned. The data owners remain as proposed although the types and flow of data have been altered for certain products. The changes and the reasons for them are as follows:

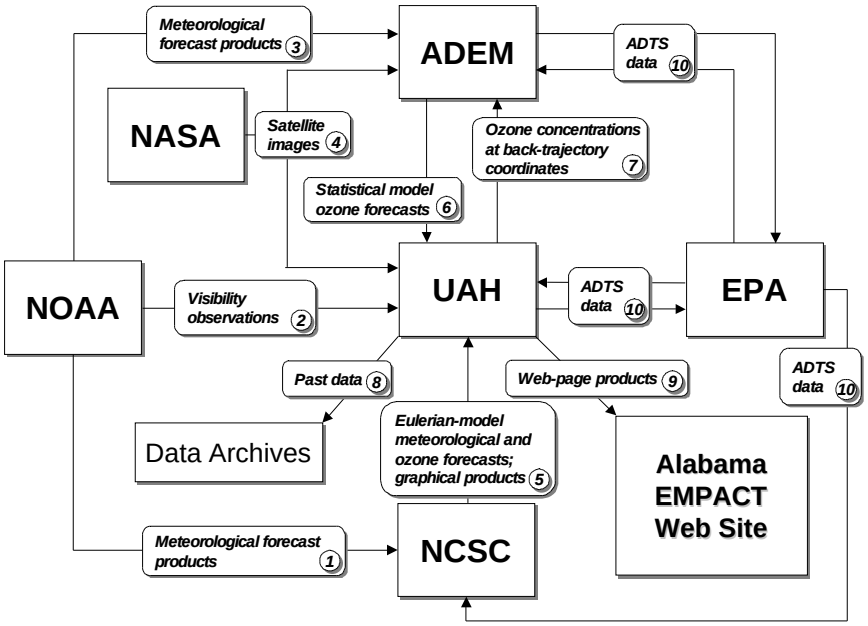

Figure 5. Organizations participating in the Birmingham-EMPACT project and the types of data exchanged.

Items 1, 3, 5 (Eulerian model forecasts --- meteorological and photochemical): In 2001, these products were resident in the MCNC website only. In 2002, a link will be provided to these products on the MCNC website from the EMPACT-Birmingham website at UAH. Arrangements to establish the link have not been completed.

Item 2 (Visibility observations): This item is in development and will be described further in the Future Activities section.

Item 4 (Satellite images): Satellite images are available and will be included in the Birmingham-EMPACT website via a link to the appropriate NASA site. Arrangements to establish the link have not been completed.

Item 6 (Statistical-model ozone forecasts): Next-day and weekend forecasts of ozone for the Birmingham area, prepared by the Alabama Department of Environmental Management (ADEM) will be included in the Birmingham-EMPACT website via a link to the ADEM website. The link has not yet been established.

Item 7 (Ozone concentrations at back-trajectory coordinates): The plan calls for the HYSPLIT back-trajectory model to be run each day using forecast meteorology as the basis for computation of the back trajectories. The HYSPLIT model has not yet been installed in the computational system.

Item 8 (Past data): The plan calls for a formal database system to be installed for storage and retrieval of certain data collected by the project. Such a formal database may not be necessary. The volume of data requiring storage on the Birmingham-EMPACT computer at the University of Alabama in Huntsville (UAH) is relatively small and is in the form of text files. The files are named using recognizable conventions and can readily be retrieved and viewed.

Item 9 (Web-page products): Creating and displaying graphical depictions of the data received from the Jefferson County Department of Health (JCDH) is being done hourly from 7:00 am to 9:00 pm rather than every 24 hours. Also, more species are being displayed than originally planned. Besides ozone and $PM_{2.5}$, the website provides views of the current concentrations of PM_{10}, and SO_2 at the Jefferson County sites. All graphics are created using the Interactive Data Language (IDL).

Item 10 (ADTS data): Data managed by EPA's Automatic Data Transfer System is available to ADEM for assistance in preparing daily and weekend statistical ozone forecasts, to MCNC for making *post-facto* assessments of photochemical model forecasts, and to UAH for preparing graphics to be placed on the EMPACT-Birmingham website. UAH downloads the previous day's ozone data each morning in order to create a regional contour map of daily peak ozone for southeastern USA. Visitors to the website will find these maps available for the past four days to facilitate visual tracking of the progress of ozone formation and transport during the period.

Future Activies (by Task)

Tasks 3, 4 : Regional visibility mapping as a surrogate for $PM_{2.5}$

In the mid-90s, the visibility measurement method at airports was converted from human observation to the automated ASOS national monitoring network. This network includes more than 900 hundred sensors of the light scattering coefficient (a good measure of both visibility and fine particle concentration) at one-minute intervals. The high spatial-temporal resolution of the ASOS network makes it an attractive source of data for use in particulate air quality assessments for two reasons: (a) direct continuous measurements of $PM_{2.5}$, such as those of the seven continuous $PM_{2.5}$ monitors in Birmingham, are relatively sparse still; (b) a strong relationship exists between light scattering coefficient and fine particle concentration, making the continuous ASOS measurement of "visibility" an excellent surrogate for fine particle concentration. There are two problems, however : (1) the high-resolution ASOS data are not currently archived as such (the data are converted to a visibility parameter called "visual range" in units of miles, then made available only at hourly averages at a quantized resolution into 18 binned ranges, with an upper cutoff at only 10 miles); and, (2) while there are over 900 ASOS sites measuring this parameter, only about 250 nationally (and about 150 of these in the eastern USA) are operated by NWS (the rest are operated by FAA and DOD). Unfortunately, only the hourly, binned, cut-off data of the NWS sites can be accessed in near-real time (and that too not easily). Our concern about the wastage of this excellent air quality dataset, simply because of the manner of its data processing and archival, is shared by several other individuals and organizations, including Dr. Stefan Falke of EMPACT. As a result, under the leadership of Dr. Falke, a consortium of partners, including the Birmingham EMPACT project as a member organization, was set up about a year ago, with three objectives:

- Collect, quality control, and archive the complete ASOS "visibility" data;
- Deliver processed hourly visibility data to public and air quality communities;
- Use a web-based system to support the acquisition and dissemination of this visibility dataset.

These objectives are contained in a white paper (Web-based Visibility Information System, 6 March 2001) prepared by Dr. Falke. Subsequently, a formal project aimed at achieving the above objectives, with the help of NOAA, has been established under EMPACT funding. Unfortunately, the product of that Project will not become available to us in time for use in the current Birmingham EMPACT project, but we will continue to work towards those objectives as a partner in the consortium (Dr. Gillani of UAH is the EMPACT-Birmingham representative in the Consortium).

One of our objectives in EMPACT-Birmingham is to utilize the eastern USA visibility data of ASOS, as much as available currently in near-real time, and after appropriate filtering of the contribution of water to the measured light scattering, as a surrogate for fine particulate regional pollution. For the coming summer, the following appears to be a practical short-term possibility. The Naval Research Lab (NRL) facility in Monterey, CA is currently acquiring the binned/cut-off/hourly visibility data of (only) the NWS stations of the ASOS network in near-real time, and is making it available to Washington University (WU, the prime contractor in the EMPACT contract for the consortium project). We are in the process of negotiating with WU to make that data available to us over the internet, either in the form received from NRL, or after processing to filter out the water contribution. Either way, if these data do become available to us in near-real time during the coming summer (we are quite optimistic), then we will use them, after proper processing, to generate daily (non-time) water-corrected visibility contour maps (much like the AIRNOW ozone maps) as surrogates for regional $PM_{2.5}$ maps. We will then provide such maps for the latest four days, in parallel with the similar ozone maps, on the EMPACT-Birmingham website (upon pressing the brown $PM_{2.5}$ button on the regional map on the homepage of our website). This will be an additional visual input in assessing the regional impact on local air quality in Birmingham.

Task 5 : Ozone modeling. We plan to continue the program of urban-regional scale meteorological/emissions/ photochemical modeling in daily forecast mode during the ozone season of 2002, this time with some of the computational load being shifted to UAH as part of the process of technology transfer from our subcontractor (MCNC) in North Carolina to our in-state partner (UAH). One new process will be implemented in the area of modeling this year. MCNC will make the daily meteorological forecasts web-available in near-real time; UAH will access this information to compute 24-hour back trajectories at appropriate boundary layer heights, starting in Birmingham at the forecast time of tomorrow's peak local ozone, using the HYSPLIT software from NOAA and the forecast meteorology. UAH will then estimate an interpolated value of observed ozone (using the AIRNOW data) at the location and time (today) of the upwind endpoint of the back-trajectory. This information will be made available to the ADEM statistical forecasting effort as soon as possible. ADEM will then generate an alternate peak ozone forecast for tomorrow based on use of this upwind ozone information in place of the standard use of today's local measured ozone value. The use of the local ozone value of today in projecting tomorrow's value amounts to making the assumption of 24-hour persistinceof the local airmass --- clearly a poor assumption in most circumstances. The use of the appropriate upwind value represents an attempt to account for airmass transport during the latest 24 hours (but not the chemistry during that time --- the accounting of both the transport and the chemistry is done in the comprehensive Eulerian modeling program). The use of the upwind ozone value during 2002 will be done in the form a straight substitution of the local value by the upwind value into the same statistical formula (actually derived through a linear regression optimization process using the local value). This, of course, is not the optimal way to utilize the upwind value. Ideally, a new statistical regression equation should be derived using the upwind value in the optimization process. Unfortunately, this will have to await a later time. In any case, we will have generated a whole summer's worth of the upwind values during 2002, to usein any future optimization effort.

Task 6 : Public Outreach. We plan to be ready at the beginning of the 2002 ozone season (May 1) with our fully-developed and operational EMPACT-Birmingham website for a major media event to launch our 2002 public outreach program. The objective will be to let the local media and the public know about our program and its publicly accessible, user-friendly resources and products. We will continue this media-based effort of public outreach throughout the season, with the objective of achieving substantial public awareness and utilization of our EMPACT efforts. This effort will be reinforced with our already substantial program of public education programs through direct contact with the public and the stakeholders.

Task 7 : Program Sustainability and National Program Transferrability. This part of the program will be an important objective during 2002, and the effort will be driven more or less as described in our original proposal. All aspects of the program are being developed and implemented locally in Alabama, except the photochemical forecast modeling component. Our plan is to begin to do this in Birmingham in the future, as a shared effort between ADEM and UAH. Currently, under separate EPA funding (under the Southern Oxidants Study Program), UAH has already developed the capability and needed computational resources to implement MM5 and Models-3/CMAQ in house. We plan to replace the use of MAQSIP with CMAQ in the future, in our forecast modeling program. We will have to develop an RT version of CMAQ patterned after the evolution of MAQSIP-RT from MAQSIP as available to the public. The main current deficiency of our Alabama team in the application of urban-regional Eulerian air quality modeling is with respect to implementation of the emissions model SMOKE. In early April, Dr. Biazar of UAH and Ms. Lee Bacon of ADEM will participate in a weeklong intensive SMOKE training program at MCNC in North Carolina. Also, Dr. Gillani of UAH will join them there subsequently to plan out the technology transfer process from MCNC to UAH during the remainder of 2002. The main pending requirement to continue the forecast Eulerian modeling program in Alabama in the future will be the procurement of the needed unds for ADEM and UAH. The current hope is that ADEM will be able to generate such base-level funding for such effort.

Relevant Websites

Main EMPACT-Birmingham website at UAH : http://vortex.nsstc.uah.edu/empact_bhm/
Password protected Website at MCNC: http://emc.mcnc.org/projects/SECMEP/index.html
JCDH website (Home): http://www.jcdh.org/
JCDH website (Air Pollution Control): http://www.jcdh.org/default.asp?ID=79
JCDH website (Daily AQI): http://www.jcdh.org/default.asp?ID=80
ADEM website : http://www.adem.state.al.us/EnviroProtect/Air/AirQualAla/airquaal.htm
AL Partners for Clean Air : http://www.alabamacleanair.com/