National Science Foundation

NEWS

Jeffrey Norris
(202) 357-9498

For Release:
IMMEDIATE
NSF PR 91-63

BLACK SMOKE FROM ABOUT 3 MILLION BARRELS PER DAY OF BURNING KUWAIT OIL LIKELY TO FALL TO EARTH QUICKLY, SCIENTISTS SAY

Hundreds of Kuwaiti oil fires set by retreating Iraqi troops during the last days of the Gulf war are emitting large amounts of carbon dioxide and other gases into the atmosphere, while locally their black smoke is blocking out sunlight, lowering temperatures, and engulfing the area in a mist of microscopic oil droplets.

In the context of this bleak picture, there may be some consolation in a preliminary analysis of the most extensive data yet collected on the atmospheric behavior of the fires' giant smoke plumes, which indicates that the smoke, bearing a Pandora's box of pollutants and potentially climate-disrupting components, probably will not travel outside the region.

Scientists who recently returned from the Gulf said at a Washington news conference at the National Science Foundation Monday (June 24) morning that the black smoke is very unlikely to reach the stratosphere and linger in global skies, but instead is probably being removed from the atmosphere within days of emission. In addition, levels of toxic and acid-rain-causing sulfur pollutants are lower than anticipated.

-more-

"The researchers have conducted the most comprehensive measurements to date of atmospheric impacts of the oil fires," according to Robert Corell, assistant director for geosciences at NSF, the federal agency that coordinated the U.S. study. The research also was funded by the Defense Nuclear Agency, the Department of Energy, and by the National Geographic Society, a major non-governmental source of support.

"We expect some regional effects on weather, but the preliminary findings thus far do not suggest that there will be major disruptions to global weather or climate," Corell said. "Nonetheless, the U.S. government will place more studies in the field to assess atmospheric impacts over time. These will be coordinated with host countries and with the World Meteorological Organization."

The results should provide fundamental insight into processes important in studies of clouds, climate, global change and air pollution, Corell added.

Peter Hobbs of the University of Washington and Lawrence Radke of the National Center for Atmospheric Research (NCAR), a National Science Foundation-funded center, led the 27 scientists who participated in the expedition, and presented the preliminary scientific findings Monday. Hobbs directed research aboard the University of Washington's Convair C-131A, and Radke oversaw operations aboard the NSF-owned, NCAR-operated Lockheed Electra.

From May 16 through June 12, the heavily-instrumented planes completed 35 flights between them, typically of six hours duration or more. The aircraft flew through daytime skies made black as night by smoke, extreme heat, dust, and fumes to gather data from every part of the plumes before emerging coated with oil. The airborne teams did not detect any smoke plumes above 22,000 feet.

"For smoke to cause a climatic catastrophe it has to remain in the atmosphere for a long time," Radke said. "The only way it can do that is for it to get high into the atmosphere by not being removed by clouds. Theory suggested that if the smoke were black enough it would absorb sufficient heat from the sun to climb to the stratosphere.

"But convincing evidence from these experiments indicates that no significant fraction of the smoke is going to reach the stratosphere where it might escape removal from the atmosphere. In addition, in contrast to what some had expected, the smoke particles are attracted to water, and should be removed efficiently as precipitation."

Hobbs, who, with Radke, studied the Mount Saint Helens eruption in 1980, said that, "The smoke from a typical volcano contains less sulfur dioxide, a major cause of acid rain, than is being emitted by the Kuwait fires. However, volcanos can blast material into the stratosphere. On a global basis, the recent volcanic eruption in the Philippines is likely to leave a more long-lived atmospheric signature than the oil fires."

The research teams also have obtained extensive data on the oil fires' emissions of carbon dioxide and other hydrocarbons.

"Calculations based on our airborne measurements indicate that about one million to two million tons of CO_2 per day are presently being emitted into the atmosphere by Kuwait fires," Hobbs said. "This is about one percent of the worldwide emissions of CO_2 from all sources.

"This indicates that the Kuwait oil fires are currently consuming about three million barrels of oil per day, about five percent of the world's daily oil consumption."

Hobbs said that the oil fires are relatively close together and that their plumes tend to merge and broaden downwind. The plume has darkened skies as far away as the United Arab Emirates, about 500 kilometers from Kuwait, Hobbs said. If the plume was superimposed on the East Coast and travelled south from New York City, it would extend through Florida, he added.

The experiments demonstrated that models of smoke plume transport were inaccurate, according to Radke. The data gathered during the airborne expedition will assist in improving the models, he said.

Alan Bandy, an atmospheric chemist from Drexel University who studied sulfur chemistry from aboard the Electra, also spoke at the press conference. Bandy found the highest concentrations of sulfur dioxide within dark plumes close to the burning wells. These concentrations were in excess of five parts-per-million, Bandy said, but decreased to one to ten parts-per-billion 650 kilometers downwind, a level typical of a large urban area.

In addition, two highly poisonous gases which researchers anticipated finding, hydrogen sulfide and carbonyl sulfide, were not detected at levels significantly above background, according to Bandy:

"These two gases, which were expected to be present, are in fact not important. This is evidence that the gases emitted by the fires are burning efficiently, unlike the oil."

Data for many other toxic compounds that may be present in the smoke have not yet been analyzed, the researchers noted.

In the smoke near the fires, the scientists found very large numbers of particles, in concentrations roughly one thousand times greater than in clean Gulf region air. These particles are "hydrophilic," -- water loving -- and serve as nuclei on which cloud droplets can form.

Though the particles are likely to impact regional cloud formation and precipitation, the data have not been examined sufficiently to draw any firm conclusions, according to the scientists.

Another impact on weather within a few hundred kilometers of the fires may result from additional heat absorption due to the darkening of desert sands from fallen smoke particles. However, because there is much blowing dust and sand, it is unclear how dark the ground will become or remain, the researchers said.

"After the fires are out, much of the southern half of Kuwait may be coated black where it once was white," Radke said. "Think of walking on the beach on a sunny day, and then walking on the asphalt road that runs by the beach; your feet know the difference."

-end-

(6/24/91)