earth sciences

Blowing (heat) bubbles in the air

Commerce Department scientists have been studying the ionosphere by modifying it with a 100-megawatt radio beam. The first year of research, report William F. Utlaut of the Office of Telecommunications and Robert Cohen of the National Oceanic and Atmospheric Administration's Aeronomy Laboratory, produced some surprising results.

As expected, the radio beam created huge heat bubbles up to 100 miles in diameter in the ionosphere by raising temperatures of ionospheric electrons as much as 35 percent. It was expected that the rise in temperature would enhance the radio reflectivity of the region, but exactly the opposite occurred.

Another unexpected result, the scientists report in the Oct. 15 SCIENCE, was the artificial creation of a natural phenomenon known as Spread F, a patchy pattern of reflected signals from the upper layer of the radio-reflecting region of the ionosphere. Spread F, occurs at night under certain natural conditions and suggests instabilities in the ionospheric plasma.

Tectonic stretch and squeeze

According to present concepts of plate motions, eastward motion of the Pacific crust from the East Pacific Rise should produce compression where it meets and sinks under the westward-drifting South American continent. Geophysical evidence in this region, however, indicates extension of the crust.

The observed extensional deformation is not incompatible with the postulated plate motions, says H. R. Katz of the New Zealand Geological Survey. Subsidence of the crust into the trench would produce extension directly over the trench, and a recent model suggests that gravitational pull on the part of the plate that remains on the surface could affect the adjacent continental mass far inland.

Extensional stress off Chile, writes Katz in the October AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS BULLETIN, would be generated on both sides of the Chile trench across a width of 400 kilometers. As South America moves west, its margin breaks up into blocks that dissappear into the trench. Compression would be possible only far inland.

Dating recent lava flows

Determining the ages of Hawaiian lava flows between 200 and 1,000 years ago presents difficulties. Carbon 14 dating is usually impossible because sufficient carbonaceous material is difficult to find, and other isotopic methods are inapplicable to this time range.

I. A. E. Atkinson of the New Zealand Department of Scientific and Industrial Research and L. D. Swindale of the University of Hawaii experimented with dating these late prehistoric lava flows by measuring weathering changes of surface rocks. They took samples of weathered and unweathered rock from the eastern slopes of Mauna Loa and Kilauea volcanoes, and investigated such weathering changes as acidity, hydration, oxidation and mineralogical and elemental changes. The most useful parameters, they report in the Oct. 8 NATURE, were acidity and weight loss by hydration and adsorption when the rocks were heated from 110 to 350 degrees C.

aerospace

NASA's new military office

The National Aeronautics and Space Administration is a civilian agency; however, it's parent agency was the National Advisory Committee for Aeronautics, which, prior to Sputnik, was involved with aircraft research for the military. Even now, one estimate is that NASA's Langley Research Center conducts almost half its research for military support.

NASA headquarters has now created a new office to accommodate this ongoing research: the Military Aircraft Programs Office. This office will direct the ongoing support to the Air Force on the F-15 and B-1 programs and to the Navy on the F-14 programs. The office will be responsible for the direction of the Air Force/NASA transonic aircraft technology program in which a NASA supercritical wing will be flight tested on an F-111 (SN: 7/17/71, p. 41). It will also work with the Army/NASA tilt rotor research aircraft technology program.

Feasibility of offshore airports

Representatives from seven fields including environmental control and aviation met this month in New York to define problems and evaluate prospects for the construction of a multi-function offshore facility that could include a jetport, nuclear power plant, deepwater port, waste treatment facility and "free port" for New York City.

The conference, co-sponsored by New York City and the American Institute of Aeronautics and Astronautics, concluded that the project would be feasible technologically but recommended the initiation of a major environmental impact study. The facility would be from three to ten miles offshore with access by rail.

The group identified positive as well as possible negative environmental effects: elimination of noise and airport pollution from the city and dispersion of airport fog and heating of runways by using the waste heating from the power plants. They concluded that an earthen dike would be the best type of construction. The rocky slopes of the dike would be an ideal place for spawning of fish, and oil spills in the area would go into the dike to be pumped out.

Possible environmental damages include interference of the structure with waves and currents, possible trapping of water pollutants, introduction of noxious materials, interference of wildlife migration habits and the introduction of turbidity during construction.

Land surveys with laser beams

RCA Corp. has developed for NASA a laser system that reportedly will make possible faster and more accurate land surveys of national parks, forests and other large tracts of Government property. It will be used in a pilot program being conducted by the Goddard Space Flight Center for the U.S. Forest Service.

The laser system would be mounted on a tripod at a given property point; the beam would then be transmitted vertically upward. A second man, with a laser sensor developed by NASA, would detect the vertical beam, and with a compass, locate the exact position of the laser. The method would eliminate current line-of-sight techniques used in surveying.