1410 Chemistry of the atmosphere
EFFECTS OF NON-METHANE HYDROCARBONS IN THE ATMOSPHERE
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The photochemistry of several unreactive and moderately-reactive non-methane hydrocarbons in the background troposphere and stratosphere was investigated. A one-dimensional, steady-state model was employed to determine the vertical distributions of C_2H_6, C_2H_2, C_3H_8, C_4H_{10}, and C_5H_{12}. The impact of these species upon the tropospheric and stratospheric odd-hydrogen, odd-oxygen, chlorine and carbon systems was studied for various possible free radical profiles and eddy diffusion coefficients. Our results indicate that NMHC probably have only a small effect upon the background atmospheric photochemistry although they might constitute a non negligible source of atmospheric CO. If the chlorovinyl molecule (CHCl = CH) were stable in the lower stratosphere it would then be conceivable that C_2H_2 could be partially effective as a chain terminator to impede catalytic removal of stratospheric O_3 by Cl and ClO.

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1420 Chemistry of bodies of water
THE DENSITY OF NORTH PACIFIC OCEAN WATERS
See 4750 Physical properties of seawater

1420 Chemistry of bodies of water
AN ABYSSAL SHEAR ZONE
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At GEOSECS station 28 in the basin east of the Newfoundland Ridge dramatic evidence for the "underthrusting" of the benthic boundary layer was encountered. Results from the continuous temperature, salinity and nephel measurements and from discrete water samples are presented in order to document that strong shearing within the near bottom water column must occur in this area. These observations amplify previous observations that Denmark Straits overflow water penetrates as a thin wedge far to the south of its place of origin. Benthic mixed layers several tens of meters in thickness have been observed at many places on the sea floor (Lachenbruch and Marshall, 1968; Amos et al., 1971; Weatherly and Niiler, 1974; Millard, 1974). During the GEOSECS Atlantic and Pacific expeditions such layers were encountered at about two-thirds of the stations occupied. While in most cases the water in the benthic mixed layer has the same θ-S characteristics as the overlying water, a few areas were encountered where this is not the case and lateral shear between the boundary layer and overlying water column must be invoked in order to explain the observed structure in the water column. The most spectacular of these, the basin east of the Newfoundland Ridge, is discussed in this paper. The phenomena we wish to describe is best documented at GEOSECS station 28 (see Fig. 1 for location). Traces of temperature and salinity for the lower 500 meters of the water column at this station are reproduced in Figures 2 and 3. Both T and S show sharp offsets at a depth of about 4865 meters (35 meters above the bottom). The offset in temperature is 15 thousandths of a degree and that in salinity 8 thousandths of a per mil. As shown on the potential temperature versus salinity plot in Figure 4 the points for the bottom layer lie well off the deep water trend. They appear to lie on the extension of the θ-S trend for waters above the Two Degree Discontinuity (Broecker et al., 1976). The nephelometer trace obtained using the Spencer-Sachs laser instrument also shows a sharp offset (see Fig. 2). The water in the abyssal layer is less turbid (at least to the laser beam) than the water immediately above the offset. Only lateral motion between the boundary layer and overlying water column could produce these observed depth distributions. These same features are shown by the data obtained on the water samples brought to the surface by the rosette sampler in which the CDT was located. As shown in Figures 5 and 6 the thin bottom layer has a lower dissolved silica and higher dissolved oxygen content than the water above the offset. The points for water samples taken below the offset lie off the property-property trend for the deep water column (see Fig. 7). Excess radon is found only in the boundary layer (see Fig. 8). The sediment-derived radon does not penetrate into the overlying water. At station 27, 3° to the north of station 28, the same feature is present but it is much less prominent. At station 29, 3° to the south of station 28, the feature is absent. The results for near-bottom samples from these three stations are compared in Table 1. The existence of low silica water underriding the water column in this region has been noted by several previous expeditions (Mann et al., 1973). This water has been interpreted as young water overflowing from the Denmark Straits. The presence of tritium (Roether and Munnich, 1974; Ostlund et al., 1974) in this water verifies that it contains a component which has been in contact with the surface during the last decade or so. Our results provide a more detailed picture than was heretofore available of the strong shear associated with this underriding water. The tritium section (reproduced from that published by Ostlund et al., 1974) and silica section (based on GEOSECS data) for this area given in Figure 9 nicely portray the setting in which this underlayer is generated. Silica is a tracer for "old" deep water and tritium for "new" deep water. In this case a tongue of "old" water moving to the north from the central gyre of the western basin is being overridden and underridden by "new" waters generated at the north end of the Atlantic. The thin wedge of water at the base of the station 28 water column is the last vestige of relatively pure "new" bottom water. The θ-S and Si-S diagrams in Figures 10 and 11 also portray this phenomenon. The returning tongue of central gyre water carried with it a component of water entering the western basin from the Antarctic (see Broecker et al., 1976, for a discussion of this phenomenon). The low salinity and high silica content of this southern water give the tongue its distinctive signature. The appearance of this low salinity high silica old water is first noted at station 1. To the north of this station mixtures of the "new" waters dominate. At station 28 the thin wedge of new water is warmer and more saline than the overlying water. Thus the more rapid diffusion of heat relative to salt could have a stabilizing influence. However, as the opposite is true at station 27 (see Table 1), the existence of a temperature inversion cannot be called upon as a necessary condition for the generation of this thin wedge of benthic water. Until the temporal and spacial variability of this feature has been studied any attempt to explain its dynamics would be premature. Hence we have concentrated on the description of the phenomena as seen at one point in time at GEOSECS station 28.

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1430 Chemistry of meteorites and tektites
A SURVEY OF CADMIUM ISOTOPIC ABUNDANCES.
See 6560 Meteoritics.

1440 Chemistry of the solid earth
PHASE EQUILIBRIA IN FLUID INCLUSIONS IN ULTRAMAFIC XENOLITHS
See 8699 Volcanology topics

1440 Chemistry of the solid earth
THE SOURCES OF ISLAND ARCS AS INDICATED BY Nd AND Sr ISOTOPIC STUDIES
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Island arc lavas from New Britain and the Marianas have $^{143}Nd/^{144}Nd$ similar to other oceanic basalts and distinctly different from continental flood basalts and thus appear to be derived from a high Sm/Nd, light-REE-depleted reservoir. Consideration of both Nd and Sr isotopes suggests seawater involvement in the generation of some island arc lavas and thus indicates that they may be derived from altered subducted oceanic crust. Other island arc lavas show no evidence of seawater involvement and may be derived from mantle reservoirs with affinities to the sources of ocean island basalts. Andesite and rhyolite from an Andean volcano reflect assimilation of old continental crust. Nd and Sr in basaltic and ultrapotassic continental rocks indicate that some mafic magmas in continental regions may be derived from old low-Sm/Nd reservoirs or are heavily contaminated with old continental crustal material. Fish debris from the ocean floor provides an estimate of $^{143}Nd/^{144}Nd$ in seawater and indicates that light-REE in the marine environment are derived mainly from continents. Basalts erupted above sea level in oceanic and continental areas are isotopically distinct from those erupted on the ocean floor, suggesting a relationship between parental reservoirs and hydrostatic head.

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Geodesy and Gravity 1900

1905 Artificial satellite techniques
CORRELATED ERRORS IN SATELLITE GEOIDS
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The vertical component of position of the GEOS-3 satellite has been computed to an accuracy of 2 m by analysis of Doppler observations. Comparison of altimetry data from the satellite at the intersections of ground traces of the orbital path yielded corrections to the satellite position such that the contribution of the orbit error to the error in the geoid computed from the altimetry data would be as low as 20 to 30 cm if the original orbit errors were uncorrelated. However, simulations of the effects of uncertainties in the gravity field have shown that the orbit errors are correlated over a distance of about 500 km normal to the direction of the satellite track. As a consequence, the geoid based on the GEOS-3 altimetry will have correlated errors which are estimated to be 50 cm with a wave length of 2500 km. The results imply that the geoid based on SEASAT-A altimetry data will have correlated errors over similar distance, (satellite altimetry, geoid, SEASAT, GEOS-3)

Geophys. Res. Lett., Paper 7L0907

1910 Crustal movements
GEODESY BY RADIO INTERFEROMETRY: DETERMINATION OF A 1.24 KILOMETER BASELINE VECTOR WITH ~5 MILLIMETER REPEATABILITY
See 1990 Geodesy: instruments and techniques

1935 Low-order harmonics of the gravity potential field
CORRELATED ERRORS IN SATELLITE ALTIMETRY GEOIDS
See 1905 Artificial satellite techniques

1990 Geodesy: instruments and techniques
GEODESY BY RADIO INTERFEROMETRY: DETERMINATION OF A 1.24 KILOMETER BASELINE VECTOR WITH ~5 MILLIMETER REPEATABILITY
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The 1.24-km baseline vector between the two antennas of the Haystack Observatory was determined from X-band radio-interferometric observations of extragalactic sources via a new method that utilizes the precision inherent in fringe-phase measurements. This method was employed in 11 separate experiments distributed between October 1974 and January 1976, with each being of duration between about 5 and 20 hours. The rms scatters about the means for the vertical and the two horizontal components of the baseline obtained from the eleven independent determinations were 7, 5, and 3 mm, respectively. The corresponding scatter for the baseline length was 3 mm; the mean differed from the result obtained in a conventional survey by 8 mm, well within the 20 mm uncertainty of the survey. (The determination of the direction from the survey was too crude to be useful.) Another external check on our data was possible since the azimuth and elevation axes of one of the antennas do not intersect,