This METEOR cruise was the German contribution to the International Quiet Sun Years (IQSY) in which the international scientific co-operation of the International Geophysical Year (IGY) was continued. Whereas, in the IGY geophysical phenomena were investigated at the time of increased sunspot activity, now similar measurements at a sunspot minimum were intended. As the effects of the solar processes are to be observed mainly in the tropical ionosphere, it was the aim of this cruise to determine the state of the ionosphere and the variations in the geomagnetic field in the region of the equatorial Atlantic Ocean – where the geomagnetic and geographical equators cross each other. Further geophysical investigations were applied to the structure of the Central Atlantic Ridge, the Earth’s field of gravity, as well as the latitudinal and longitudinal dependence of the ultra-radiation, which was also further investigated during later cruises. A wide field of activities was covered by meteorological measurements which provided new information concerning the atmospheric circulation, heat budget, vertical radiative fluxes, water vapour content, aerosol content, and trace-gas content, as well as the radioactivity in the atmosphere and the electric field. Furthermore, the recently discovered equatorial undercurrent was investigated by hydrographical series and current measurements.