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FOREWORD
Biogenic aerosol formation in the boreal forest (BIOFOR)

This special issue of *Tellus B* contains a set of papers describing the results of the project Biogenic aerosol formation in the boreal forest (BIOFOR), funded by the European Commission and by the Finnish Academy, and directed by Professor Markku Kulmala from the Department of Physics, University of Helsinki, Finland. Measurements of aerosol properties, precursor, trace gases and meteorological parameters, were carried out at a boreal forest site in southern Finland in 1998 and 1999. The aim was to study possible formation of new aerosol particles from biogenic precursor gases during favorable conditions. Some 50 scientists from 11 research groups in Finland, Sweden, Estonia, Germany, Ireland, Australia, UK and USA participated in the project.

The BIOFOR project has revealed certain very interesting features of the processes responsible for the formation of the observed 3-nm particles. Nucleation occurred only during specific meteorological conditions, i.e., cold air outbreaks in arctic or polar air masses. Sulfuric acid and ammonia are implicated as main precursor gases for the nucleation, a proposed formation mechanism being ternary nucleation involving these 2 gases and water vapor. This may seem surprising, since organic vapors were measured to occur in relatively high concentrations. However, it is possible that organic vapors still play an important rôle by causing condensational growth of the new particles to observable sizes, but this has not yet been verified by direct measurements of the chemical composition of aerosol particles in the critical range (up to about 20 nm diameter).

The BIOFOR project represents an important step forward in our understanding of the formation of new aerosol particles in the atmosphere. However, the project has also demonstrated that the formation processes involve complex interplay, not yet well understood, between meteorological, microphysical and chemical processes. Obviously, more research has to be carried out before the processes responsible for the formation and growth of aerosol particles are understood well enough to enable reliable estimates of the impact of man-made aerosols on climate to be made.

Henning Rodhe
Editor-in-Chief, *Tellus B*