



1352-2310(94)E0018-F

TECHNICAL NOTE

METROSE: A MODIFIED WINDROSE FOR AIR QUALITY MANAGEMENT

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(First received 17 August 1993 and in final form 21 November 1993)

Abstract A metrose is proposed for a pictorial representation of the meteorological parameters and is compared with the conventional windrose. In addition to the data represented by the windrose in relation to the wind speed and direction, the metrose includes the atmospheric stability persistence for each of the directions. The metrose is particularly more advantageous for applications in modeling and spatial planning and is more explicit than a windrose.

Key word index: Meteorology, atmospheric stability, data representation, air quality modeling, spatial planning.

INTRODUCTION

The concentration of the pollutants in the atmosphere is governed by the emission sources and micrometeorology of the region, and for air quality management, knowledge of both these parameters is vital. However, unlike the emissions, micrometeorological parameters cannot be under human control and hence its knowledge gains weightage for effective planning. The important micrometeorological parameters relevant to air pollution studies are wind speed, wind direction, and atmospheric stability. Typically for spatial planning and for communicating the information to the planners, the diagrammatic representation is popular as it has a better visual impact than the numbers in tables or charts.

THE PICTORIAL REPRESENTATION

One of the most commonly used diagrammatic representation is the windrose (shown in Fig. 1) and it gives information on wind speed and wind direction along with their persistence for the fractional period of occurrence at a given location. Though a windrose has been widely used, the information obtained from it may not be quite realistic and accurate for planning as the stability considerations in addition to wind characteristics determine the "relative vulnerability" of the directions for pollutant concentration build-up. This highlights the need for modifying the windrose itself to represent the variation in both the wind characteristics and the atmospheric stability in a single diagram. The earlier attempt on modifying the windrose has been only on the aspects of the wind characteristics variation (Patterson and Benjamin, 1975) without much emphasis on the atmospheric stability. This work attempts to modify the conventional windrose to give more information relevant to the air quality planner by incorporating the atmospheric stability in a simple manner. The pictorial information obtained thus is referred to as "metrose".

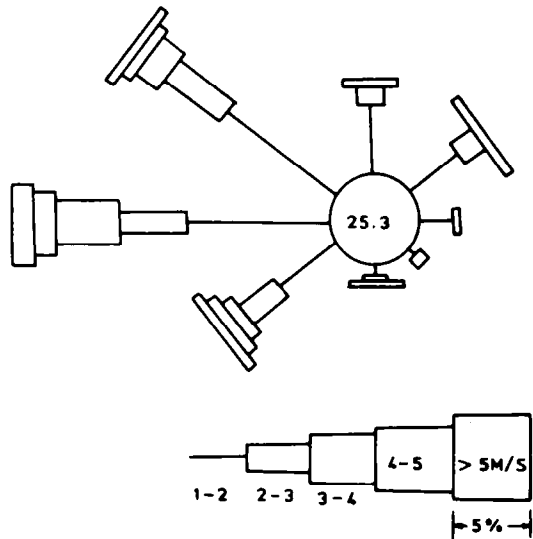


Fig. 1. A typical windrose generated for a period of one month.

THE METROSE

The metrose is aimed at providing a combined representation of the wind characteristics and the atmospheric stability variation. Specifically, the information that can be represented for each of the directions as shown in Fig. 2 is: (i) percentage occurrence of wind (length of each line within the circle), (ii) average wind speed (number at the end of the line within the circle), (iii) persistence of the stability class occurrences (length of each block of the spoke outside the circle with the alphabet representing the Pasquill stability), and (iv)