

# NORSAR

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## FINAL TECHNICAL SUMMARY

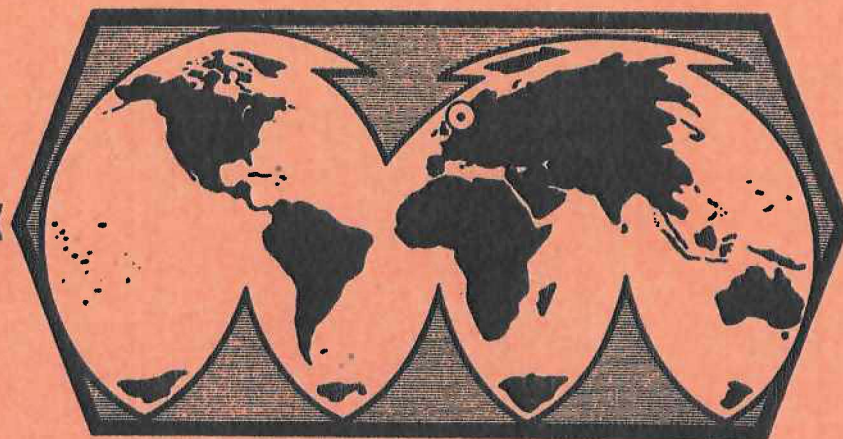
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VI.8 A Measure of Association for Spatial Variables

Motivated by problems in a statistical modelling of air pollution data, we propose a measure of association for two spatial variables  $F(\underline{x})$  and  $G(\underline{x})$ . The new measure supplements the conventional correlation and rank correlation coefficients. Because of its general nature, the measure is applicable also to spatial geophysical data and in particular to seismological array data.

The measure is based on the ranks of the observations and on the location coordinates of the measurement points: If spatial location coordinates for large F-values correspond closely to spatial locations for large G-values and similarly for small values, the two variables will be assigned a high positive degree of association. High negative degree of association is assigned if spatial locations of large values for one variable correspond to spatial locations of small values for the other variable and vice versa. For independent spatial variables  $F(\underline{x})$  and  $G(\underline{x})$  it is shown that under optimal coordinate designs the variance of the measure is of order  $1/kn$  where  $n$  is the number of data points and  $k = \dim \underline{x}$  is the dimension of the observation space. Conditions for asymptotic normality are developed, and asymptotic formulae for bias and variance are found also in the case of sampling from a population with a finite number of measurement points.

D. Tjøstheim

Reference

Tjøstheim, D. (1977): A measure of association for spatial variables, *Biometrika*, in press.