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INITIAL RESULTS DETERMINING SPATIAL AND TEMPORAL PATTERNS OF RAINFALL IN THE SPERRGEBIET, SOUTH-WEST NAMIBIA

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ABSTRACT
Rainfall data from a network of rain gauge stations in the Sperrgebiet were investigated to ascertain (1) whether winter or summer rains are more important in certain areas, (2) the between-year variation at different station and (3) the spatial variation in annual rainfall.

Keywords
Climate, southern Namib, rains.

The south-west corner of Namibia, the Sperrgebiet is the only area in the country where temperate cyclones off the Atlantic Ocean bring rains in winter (June-September) (Mendelsohn et al. 2002). However, the winter rainfall zone is not well defined and a transitional area exists, where summer and winter rains can occur. In arid areas, rains are patchy, unpredictable and highly variable (Sharon 1972), a factor that complicates interpreting rainfall data from widely spaced weather stations and applying these to a particular situation in the field. In this study we analysed rainfall data from stations throughout the Sperrgebiet.

A network of some 20 rain gauge stations was set up by Namdeb Diamond Corporation in 1996 and later augmented by the Ministry of Environment and Tourism. Rain data from the start of the observation period were analysed to describe short-term spatial and temporal changes in rainfall patterns. Although long-term data are needed to describe climate patterns in an arid area, short-term data are believed to provide some insights and generate hypotheses to be tested once longer-term data become available. Only data from stations with continuous records were included for the calculations based on three-month periods (2001-2003). These short-term data indicate initial trends that need to be re-evaluated in follow-up studies.

Are winter or summer rains more important in certain areas? The mean per quarter over a three-year period at stations along the eastern boundary of the Sperrgebiet showed that the third quarter (July-September) had the highest mean rainfall at the four southern stations – Aurus peak, borehole 4, borehole 5 and Skorpion (Fig. 1). At borehole 2, the northern-most station with adequate data, mean totals of rain were equally high in the second (April-June) and third quarter (July-September). At borehole 3, the second quarter (April-June) showed the highest mean rainfall. This indicates that summer rains appear to become more important as one moves north. Gaps in the data at the northern-most stations prevented analyses of these. It is expected that summer rains are, however even more important at these stations. On average the first and fourth quarter (January-March and October-December) had at all stations the lowest rains. At borehole 2, 3, 4 and 5 mean totals of rains in these quarters were insignificant, but both, at Aurus peak and Skorpion, some major showers outside the usual rainfall season occurred. As data were only available for three years, one significant shower could have been responsible for the diversion from the general trend.

What is the between-year variation at different stations? Between-year variation at rainfall stations (Fig. 2) decreases in the order Kaukausib > borehole 5 > borehole 2 > Aurus peak > borehole 3 (Table 1). Obib and borehole 1 only yielded two and three years of data and are not considered here. The trend in variation in rainfall does not simply follow a north-south gradient that could be linked to winter-summer rain influence. Most likely local topography may have influenced the patterns.

What is the spatial variation in annual total rainfall? At the measured stations mean total rainfall per annum decreased in the order Aurus peak > borehole 5 > borehole 2 > borehole 4 > borehole 3 > Kaukausib (Table 1). Again, Obib and borehole 1 only generated two and three years of data and are hence not listed. With a mean of 110 mm per annum, the Aurus Mountains clearly stand out as the area receiving most rains at all measured stations. At an altitude of approximately 1000 m (and about 500 m above the surrounding plains) the mountain topography is most likely responsible for these higher rainfall conditions. A similar explanation would also apply to the Obib Mountains, although the gauge is not placed on a high point, but in a valley on footslopes of the mountains. Borehole 5, just north of the Skorpion area, is also placed in a mountainous area, and again the possibility of orographic rains may lead to higher rainfall here. With the exception of borehole 2, total rainfall decreases from south to north.

Since the short-term data only indicted trends, maintenance of this rain gauge network is essential, particularly where data for several years are now available. Although stations at the coast and other biodiversity hotspots (e.g. Klinghardt Mountains) exist, care should be taken to maintain and monitor these at intervals compatible with the remaining data collection. For example, if three-monthly rainfall data cannot be collected, rainfall data should be measured at intervals compatible with these records (e.g. half-yearly or annually).

Acknowledgements

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Station	**n**	**mean**	**coefficient of variation**
Kaukausib	4	43.43	34.69
Borehole 1	3	42.07	26.68
Borehole 2	4	59.30	27.67
Borehole 3	4	50.12	23.39
Borehole 4	4	54.00	20.22
Borehole 5	5	79.56	28.72
Aurus peak	4	110.25	24.79
Obib	2	80.10	22.78

Table 1. *Mean and standard deviation of annual total rainfall for the years 1997 and 2000-2003.*

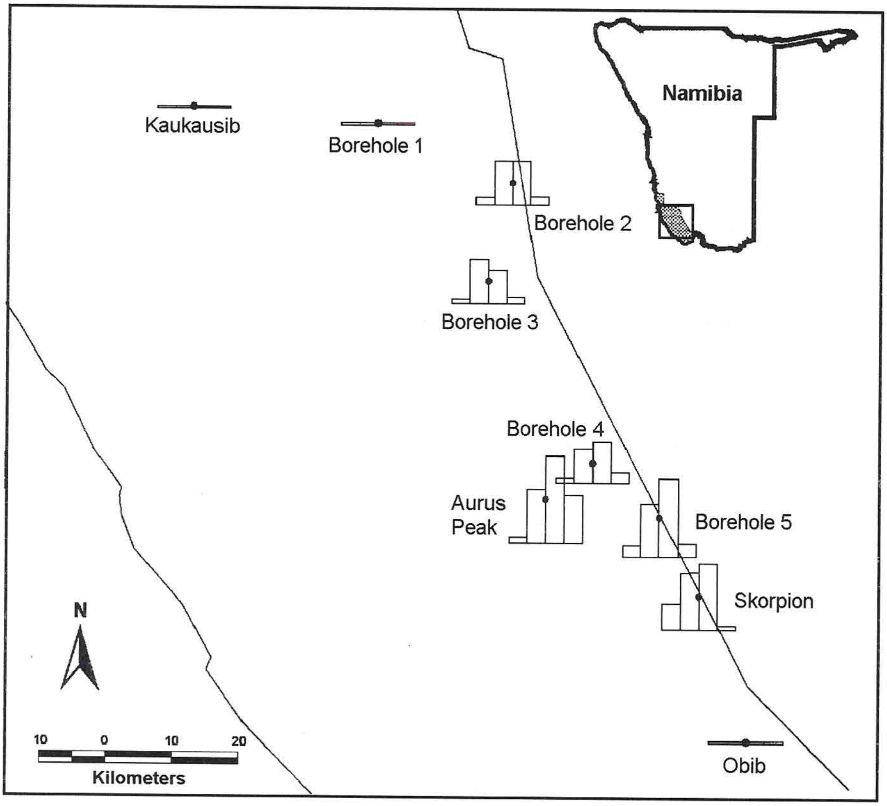


Figure 1. Mean totals of rainfall per decade for the period 2001 to 2003 (from left to right: 1. bar = January-March, 2. bar = April-June, 3. bar = July-September, 4. bar = October-December). Rainfall stations without quarterly records for the study period are also indicated, but show no data (Borehole 1, Kaukausib and Obib).

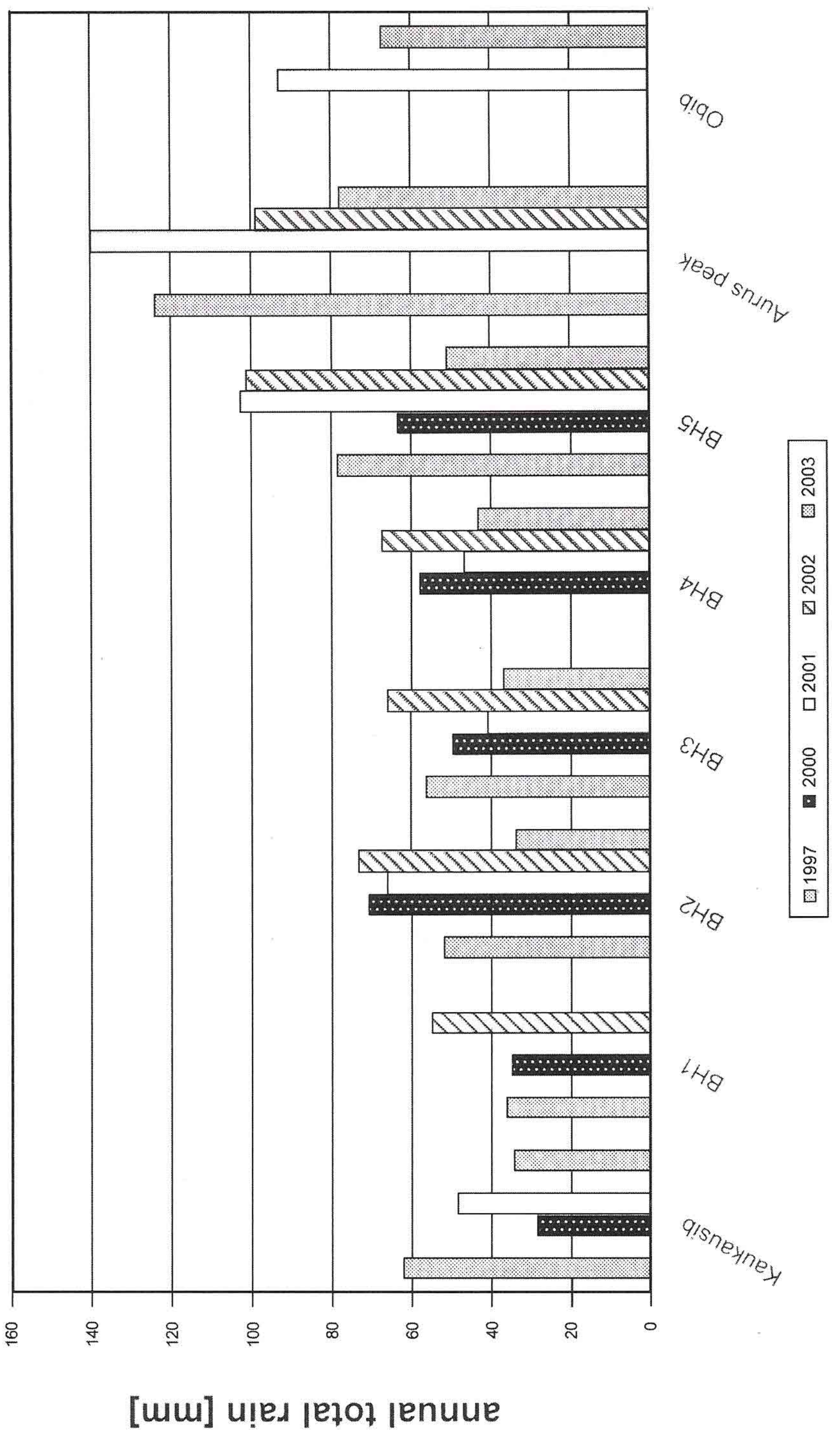
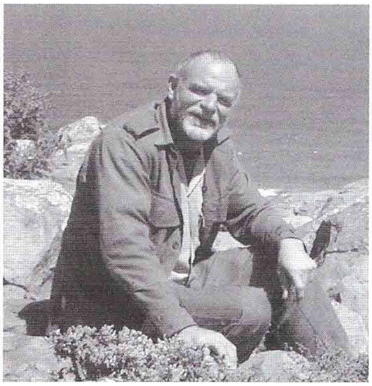


***Figure 2**. Total annual rainfall for the period 1997, and 2000-2003 for selected stations in the Sperrgebiet (BH = borehole).*

Curriculum vitae

Antje Burke is a plant ecologist who has worked in the Sperrgebiet for over 10 years.



Trygve Cooper is the Ministry of Environment and Tourism's Chief Warden of the Sperrgebiet. He resumed responsibility for the Diamond Area in 2000.

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