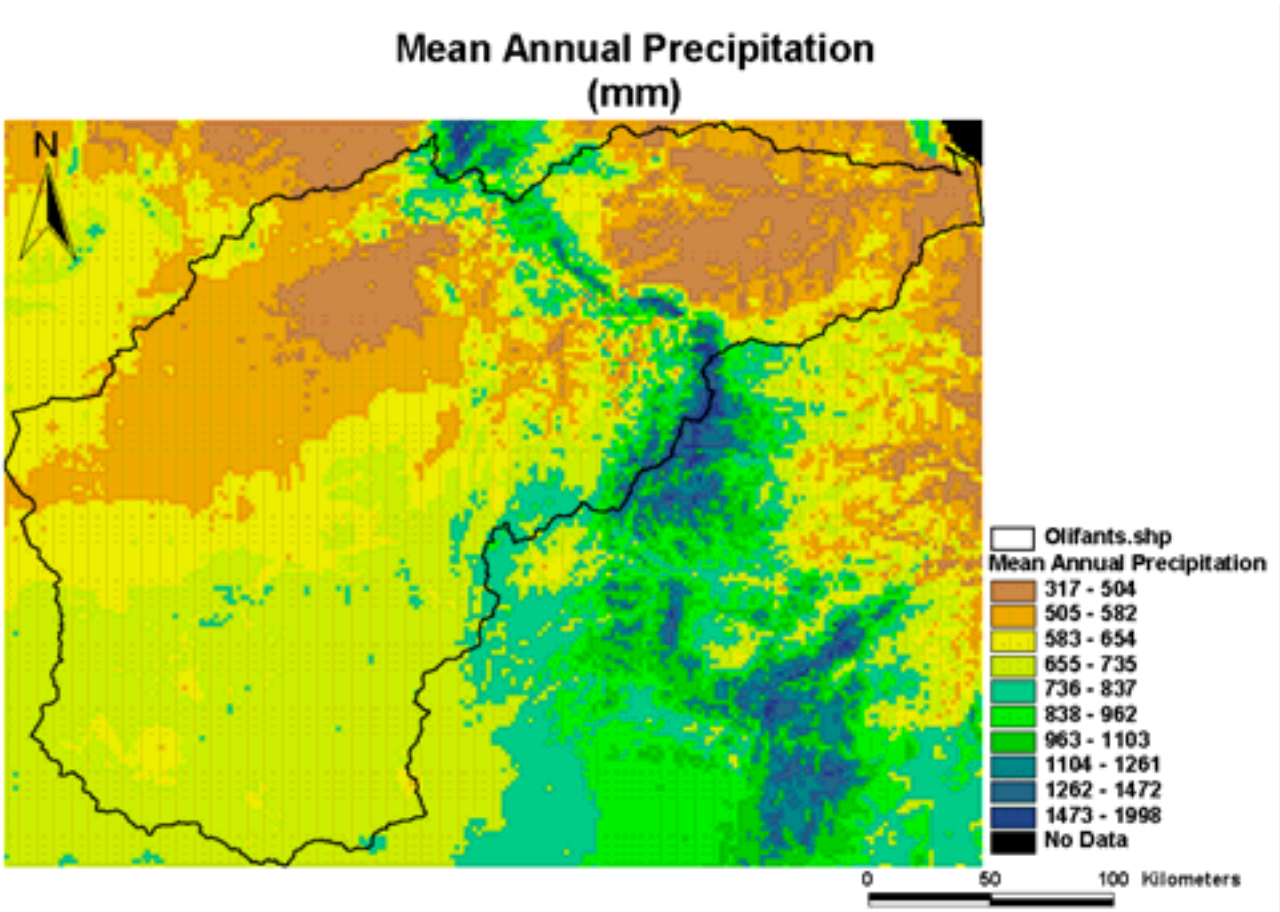

Atlas _32 THM

Mean Annual Precipitation, MAP : Concepts

The MAP (mm) characterises the long term quantity of water available to a region for hydrological and agricultural purposes. Under non-irrigated conditions it gives an upper limit to a region's sustainable agricultural potential in regard to biomass production if other factors (e.g. light, temperature, topography, soils) are not limiting.

Not only is MAP important as a general statistic in its own right, but it is probably also that climatic variable best known to hydrologists and farmers, and to which they can relate many other things. In southern African agrohydrological studies MAP has, for example, been used as a variable related to monthly rainfall distribution, design flood prediction, the number of raindays or crop production (e.g. Schulze, 1983; Schmidt and Schulze, 1987; Dent, Lynch and Schulze, 1989).

While simple to calculate and attractive to use, the concept of MAP nevertheless has its weaknesses, in that in southern Africa

*negative departures of annual precipitation (i.e. low rainfall years) are more numerous than positive ones (i.e. higher than average years), and therefore annual rainfalls are not distributed normally (i.e. they have a positive skew),

*and MAPs are frequently inflated by a few very high annual totals from very wet years, especially in areas of low rainfall.

Distribution of MAP

The overall feature of the distribution of MAP over southern Africa is that it decreases fairly uniformly westwards from the escarpment across the interior plateau. Between the escarpment and the ocean in both the southern and the eastern coastal margins there is the expected complexity of rainfall patterns induced by irregularities of terrain. About 35% of southern Africa receives less than 300 mm per annum as a result of the presence of subtropical high pressure cells which inhibit rainfall generation because of predominantly subsiding air, while only about 7% has a MAP exceeding 800 mm. Perusal of the statistics indicates that KwaZulu-Natal is the wettest province, while the Western Cape has the highest variability of MAP within any of the provinces, and the highest individual point rainfall at an estimated 3345 mm per annum.

Mean Annual Precipitation : Mapping

Dent, Lynch and Schulze (1989) divided South Africa, Lesotho and Swaziland into 34 regions, each of which was considered relatively homogeneous in relation to "controls" of rainfal distributions. These controls included altitude (and its influence on orographic lifting), distance from sea (as an index of continentality), aspect, terrain roughness and direction of prevailing rainbearing winds. Using data from over 6000 rainfall stations, equations for MAP were developed for each region, from which 1' x 1' of a degree gridded values of MAP were generated

Mean Annual Precipitation(mm)							
Province/Country	Mean Value	CV (%)	Maximum Value	Minimum Value	Exceedence Probability		
20%	50%	80%					
Northern Province	527	28	2031	200	616	517	411
Mpumalanga	736	24	1933	341	851	695	618
North-West	481	21	782	246	584	485	377
Northern Cape	202	43	540	20	284	185	129
Gauteng	668	38	900	556	693	670	638
Free State	532	22	1689	275	634	524	422
KwaZulu-Natal	845	20	1967	417	973	819	707
Eastern Cape	552	43	1722	96	768	528	332
Western Cape	348	72	3345	60	477	282	165
Swaziland	860	22	1690	451	997	832	705
Lesotho	701	21	1796	361	791	689	589

Annual Precipitation in the "Wettest" and "Driest" Years in Five

Using a frequency distribution of annual precipitation values, the "wettest year in 5" was represented by 20th percentile of exceedence and the "driest year in 5" by the 80th percentile. There is a general shift of isohyets eastwards for the driest year in 5 and westwards for the wettest year in 5.

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