WORKSHOP ON INDICES AND INDICATORS FOR CLIMATE EXTREMES: ASHEVILLE, NC, USA, 3-6 JUNE 1997
BREAKOUT GROUP B: PRECIPITATION

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Abstract. A uniform, international reference system of precipitation indices would greatly facilitate assessment of changes in global precipitation patterns, intensities and extremes. However, national/regional differences in precipitation monitoring standards, data quality control procedures, and product development practices complicate efforts to develop such a system. This report represents the results of Working Group B’s concerted effort to examine in detail the problems associated with the development of the needed indicators and the Group’s recommendations to address the identified issues. The Group concluded that a successful strategy must define a minimum set of indices/indicators based on higher quality data that would represent a global base set. The Group identified a set of indices for this purpose. This base data set should be complemented where possible by countries/regions having the data sets and processing resources to do more.

1. Introduction

Heavy precipitation, on a variety of spatial and temporal scales, causes considerable damage and loss of life worldwide, each year. However, mechanisms to monitor, understand, and predict precipitation extremes are inadequate, largely because of the lack of high-quality data and the absence of a concerted, global effort to apply consistent analyses to the available data. There is also an absence of relatively simple, uniform indices and indicators of precipitation in large parts of the world that can be used to help answer basic questions such as the IPCC question of whether climate is getting more extreme - these answers can't be provided if each country or area has its own definitions.

Working Group B addressed the needs for such indices, the availability of precipitation data from countries around the globe, and efforts that should be made to integrate these data in a common data base for international use and assessment of climate extremes. The Working Group identified a number of indices and indicators of precipitation extremes which should be applied consistently to available global data. The Group also made recommendations regarding aggregation of these indices into indicators of extremes on large spatial scales, on the development of comprehensive data sets to enhance globally-consistent analysis, and on methods for quality control and the removal of inhomogeneities in data for monitoring precipitation extremes. Working group discussions are summarized in the following sections.

2. Indices For Monitoring Precipitation Extremes

Calculation of the following indices would provide a comprehensive description of the variation of important precipitation extremes. The Group recognized that other indices may provide further information, but felt that the following set would enable useful conclusions to be reached regarding the variation and distribution of extreme precipitation. Most of the recommended indices relate to daily rainfall. It was pointed out that hourly extreme precipitation indices will be more difficult to calculate in many countries, because of the lack of digitized data.

2.1. INDICES TO BE CALCULATED FROM DAILY DATA

- Number of dry days; hail days; snow days. The definition for each of these indicators would correspond to the definition from the country of interest.
- Frequency of exceeding specified thresholds - Number of days with precipitation exceeding 90th, 95th, 99th percentiles. Do this for calendar year, seasons, or other period as appropriate (e.g., wet season in monsoonal regions). Use only days with precipitation to calculate thresholds. Calculate thresholds by simple counting and/or fitting gamma distribution. Calculate thresholds on 1961-90 reference period. Where appropriate repeat analysis separately for snow.
- Variations in magnitude of thresholds - Calculate 90th, 95th, 99th percentiles for each year separately, by fitting days with precipitation to gamma distribution. Plot as time series and smooth and calculate trends.
- Simple daily intensity index (total precipitation divided by number of days with precipitation).
- Maximum length of dry spell - number of contiguous days with precipitation below threshold (1st percentile calculated on only days with precipitation; use 1961-90 reference period).
- Using decadal moving 30-year window (e.g., 1941-70, 1951-80, 1961-90) compare frequency distribution of daily rainfalls. Examine variations in extremes of distribution.
- Percentage of annual (or seasonal as appropriate) precipitation falling on days with rainfall above 90th, 95th, 99th percentiles.

2.2. INDICES CALCULATED WITH HOURLY DATA

- Number of hours with precipitation.
- Frequency of exceeding thresholds, as for daily data (90th, 95th, 99th percentiles, calculated from 1961-90 reference period either by counting or fitting gamma distribution to hours with precipitation).
- Variations in magnitude of thresholds, as for daily data.