Box 2.4 | Extremes Indices

As SREX highlighted, there is no unique definition of what constitutes a climate extreme in the scientific literature given variations in regions and sectors affected (Stephenson et al., 2008). Much of the available research is based on the use of so-called 'extremes indices' (Zhang et al., 2011). These indices can either be based on the probability of occurrence of given quantities or on absolute or percentage threshold exceedances (relative to a fixed climatological period) but also include more complex definitions related to duration, intensity and persistence of extreme events. For example, the term 'heat wave' can mean very different things depending on the index formulation for the application for which it is required (Perkins and Alexander, 2012).

Box 2.4, Table 1 lists a number of specific indices that appear widely in the literature and have been chosen to provide some consistency across multiple chapters in AR5 (along with the location of associated figures and text). These indices have been generally chosen for their robust statistical properties and their applicability across a wide range of climates. Another important criterion is that data for these indices are broadly available over both space and time. The existing near-global land-based data sets cover at least the post-1950 period but for regions such as Europe, North America, parts of Asia and Australia much longer analyses are available. The same indices used in observational studies (this chapter) are also used to diagnose climate model output (Chapters 9, 10, 11 and 12).

The types of indices discussed here do not include indices such as NIÑO3 representing positive and negative phases of ENSO (Box 2.5), nor do they include extremes such as 1 in 100 year events. Typically extreme indices assessed here reflect more 'moderate' extremes, for example, events occurring as often as 5% or 10% of the time (Box 2.4, Table 1). Predefined extreme indices are usually easier to obtain than the underlying daily climate data, which are not always freely exchanged by meteorological services. However, some of these indices do represent rarer events, for example, annual maxima or minima. Analyses of these and rarer extremes (e.g., with longer

(continued on next page)

Box 2.4, Table 1 | Definitions of extreme temperature and precipitation indices used in IPCC (after Zhang et al., 2011). The most common units are shown but these may be shown as normalized or relative depending on application in different chapters.

Index	Descriptive name	Definition	Units	Figures/Tables	Section
TXx	Warmest daily Tmax	Seasonal/annual maximum value of daily maximum temperature	°C	Box 2.4, Figure 1, Figures 9.37, 10.17, 12.13	Box 2.4, 9.5.4.1, 10.6.1.1, 12.4.3.3
TNx	Warmest daily Tmin	Seasonal/annual maximum value of daily minimum temperature	°C	Figures 9.37, 10.17	9.5.4.1, 10.6.1.1
TXn	Coldest daily Tmax	Seasonal/annual minimum value of daily maximum temperature	°C	Figures 9.37, 10.17, 12.13	9.5.4.1, 10.6.1.1, 12.4.3.3
TNn	Coldest daily Tmin	Seasonal/annual minimum value of daily minimum temperature	°C	Figures 9.37, 10.17, 12.13	9.5.4.1, 10.6.1.1
TN10p	Cold nights	Days (or fraction of time) when daily minimum temperature <10th percentile	Days (%)	Figures 2.32, 9.37, 10.17 Tables 2.11, 2.12	2.6.1, 9.5.4.1, 10.6.1.1, 11.3.2.5.1
TX10p	Cold days	Days (or fraction of time) when daily maximum temperature <10th percentile	Days (%)	Figures 2.32, 9.37, 10.17, 11.17	2.6.1, 9.5.4.1, 10.6.1.1, 11.3.2.5.1,
TN90p	Warm nights	Days (or fraction of time) when daily minimum temperature >90th percentile	Days (%)	Figures 2.32, 9.37, 10.17 Tables 2.11, 2.12	2.6.1, 9.5.4.1, 10.6.1.1, 11.3.2.5.1
TX90p	Warm days	Days (or fraction of time) when daily maximum temperature >90th percentile	Days (%)	Figures 2.32, 9.37, 10.17, 11.17 Tables 2.11, 2.12	2.6.1, 9.5.4.1, 10.6.1.1, 11.3.2.5.1,
FD	Frost days	Frequency of daily minimum temperature <0°C	Days	Figures 9.37, 12.13 Table 2.12	2.6.1, 9.5.4.1, 10.6.1.1, 12.4.3.3
TR	Tropical nights	Frequency of daily minimum temperature >20°C	Days	Figures 9.37, 12.13	9.5.4.1, 12.4.3.3
RX1day	Wettest day	Maximum 1-day precipitation	mm	Figures 9.37, 10.10 Table 2.12, 12.27	2.6.2.1, 9.5.4.1, 10.6.1.2, 12.4.5.5
RX5day	Wettest consecutive five days	Maximum of consecutive 5-day precipitation	mm	Figures 9.37, 12.26, 14.1	9.5.4.1, 10.6.1.2, 12.4.5.5, 14.2.1
SDII	Simple daily intensity index	Ratio of annual total precipitation to the number of wet days (≥1 mm)	mm day^{-1}	Figures 2.33, 9.37, 14.1	2.6.2.1, 9.5.4.1, 14.2.1
R95p	Precipitation from very wet days	Amount of precipitation from days >95th percentile	mm	Figures 2.33, 9.37, 11.17 Table 2.12	2.6.2.1, 9.5.4.1, 11.3.2.5.1
CDD	Consecutive dry days	Maximum number of consecutive days when precipitation <1 mm	Days	Figures 2.33, 9.37, 12.26, 14.1	2.6.2.3, 9.5.4.1, 12.4.5.5, 14.2.1