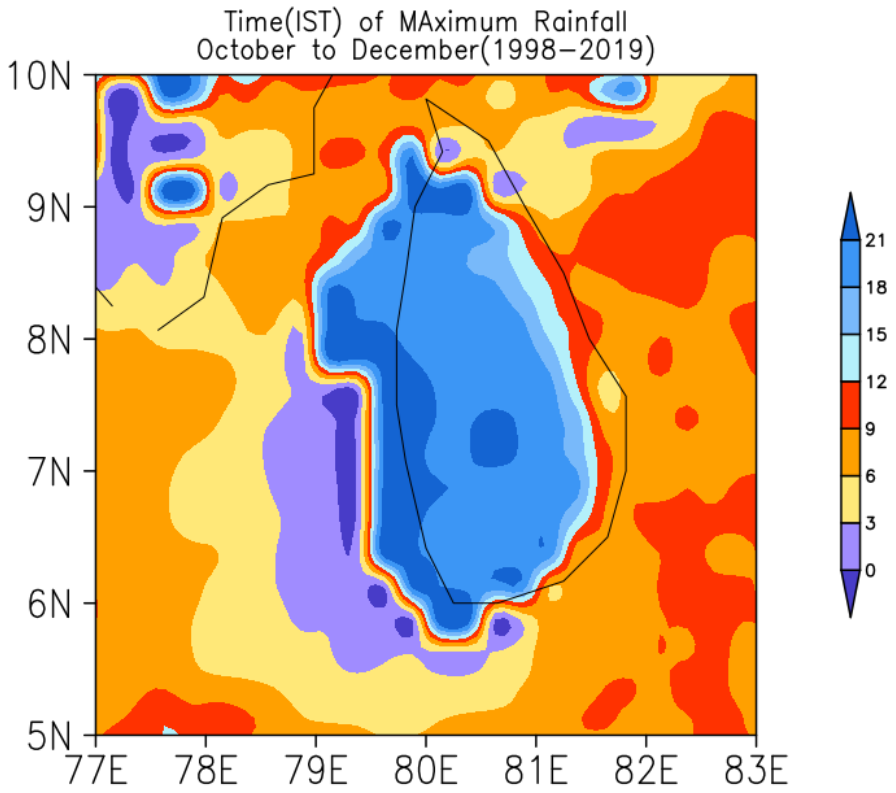

Fig. 7.7. The phase diagram of the harmonic analysis of hourly rainfall using the satellite data of 1998-2019. The phase diagram shows the time (IST) of maximum rainfall.

7.2. **Intra-seasonal variations**

There are not many studies addressing the intra-seasonal variability of the NE monsoon rainfall over Sri Lanka, which is an important component of rainfall variability. Therefore, a preliminary analysis on the intra-seasonal variability of rainfall over Sri Lanka is done and the results are discussed below.

Fig. 7.8 shows the daily rainfall averaged over Sri Lanka during the period 1 Oct 2018- 31 Jan 2019 (above) and 1 Oct 2019- 31 Jan 2020 (below). These two years are selected just as examples to show the rainfall variations within the season. The plot suggests that there is significant rainfall variability within the season, with specific periods of more rainfall, interspaced with little or no rains.

To examine whether daily rainfall has particular periodicity, a spectral analysis of daily rainfall was made for both the years, 2018-2019 and 2019-2020. The results are shown in Fig. 7.9.

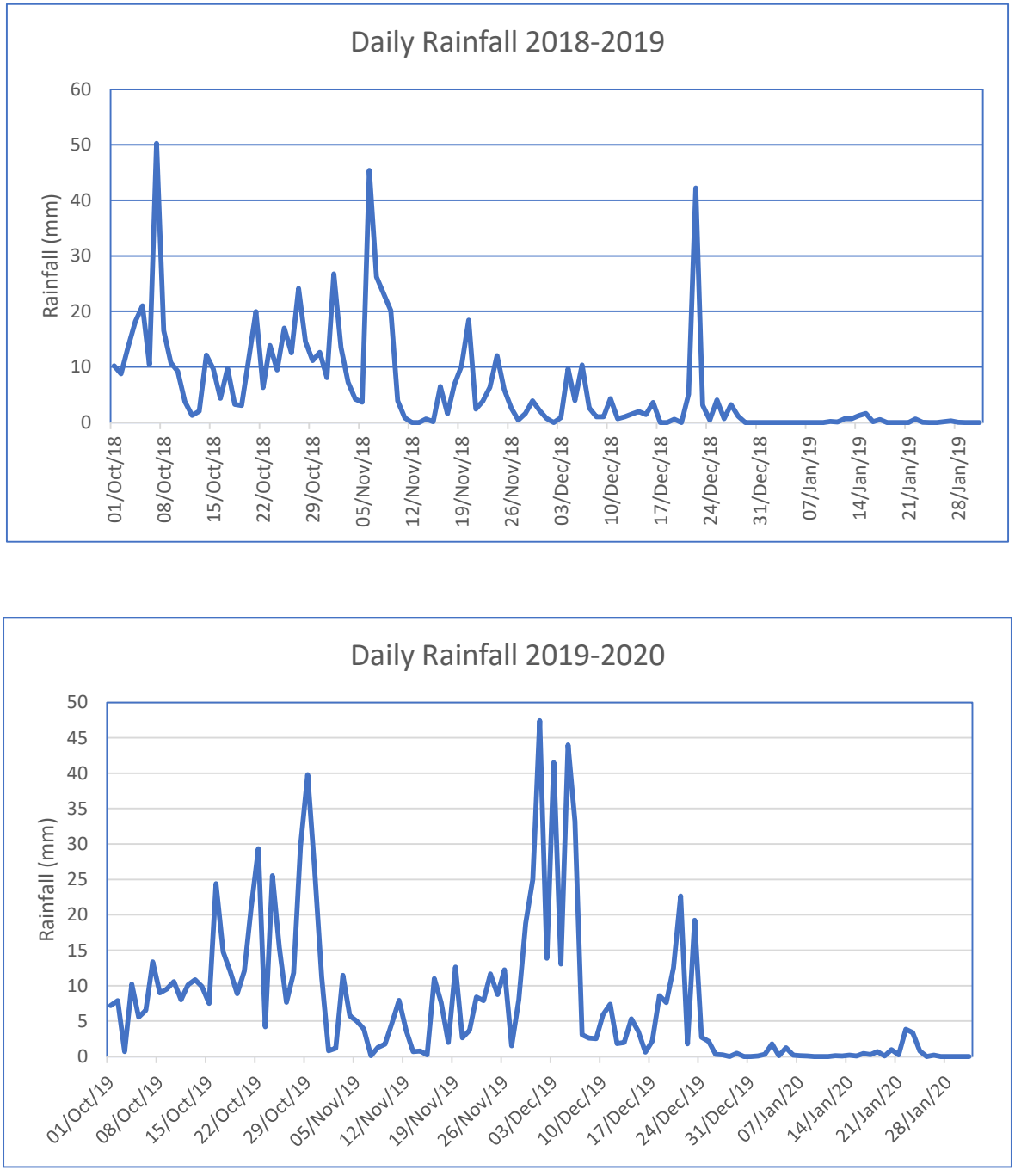

Fig. 7.8. Daily rainfall (in mm) averaged over Sri Lanka during the period 1 Oct 2018- 31 Jan 2019 (above) and 1 Oct 2019- 31 Jan 2020 (below).

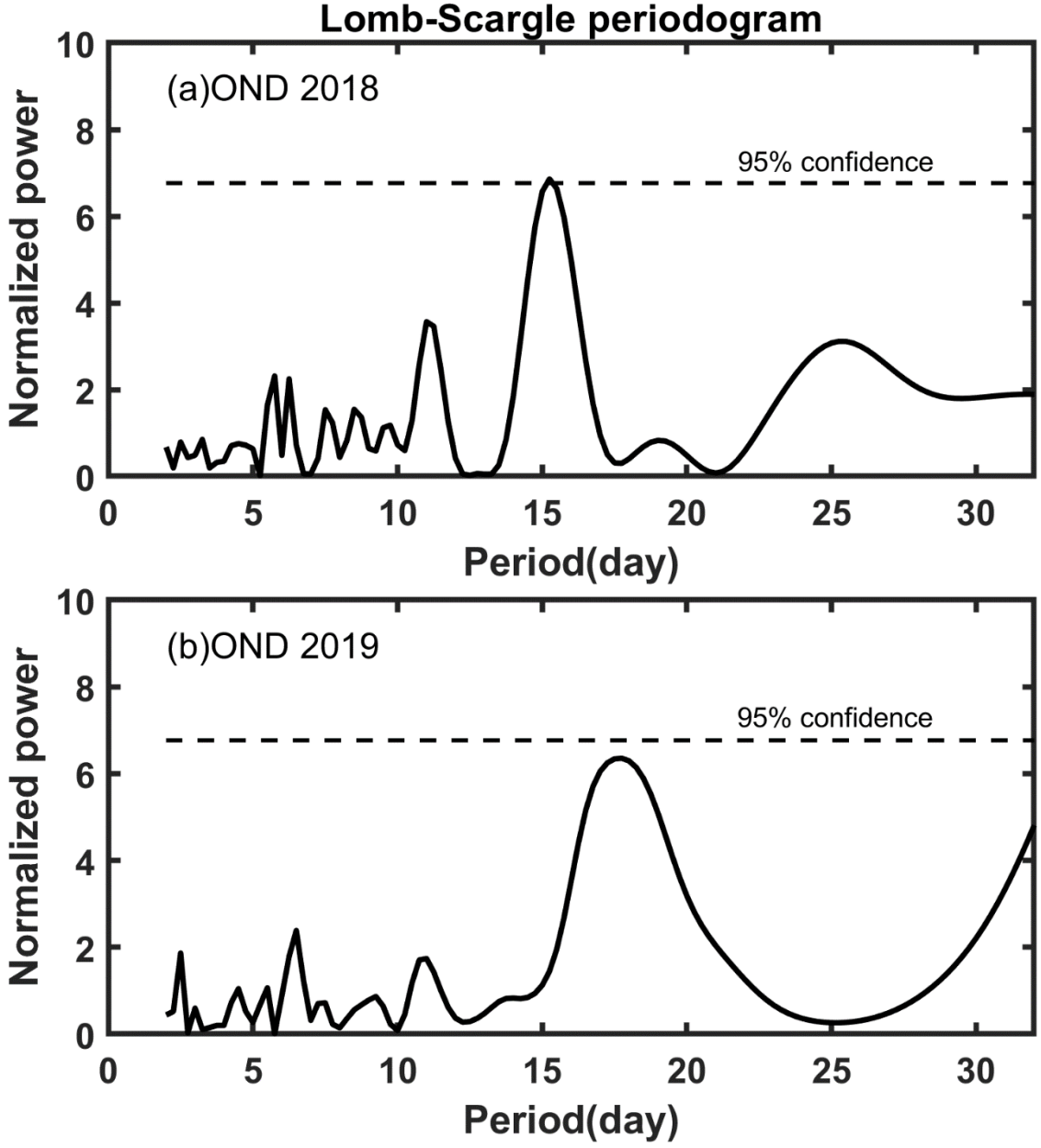

Fig. 7.9. The spectral analysis (Lomb-Scargle periodogram) of daily rainfall for the two seasons. 2018-2019 (above) and 2019-2020 (below). The 95% significance level is shown as horizontal line in both the plots.

The results indicate that there is a strong periodicity of about 15-20 days, which is statistically significant. The physical mechanisms of such periodicity are immediately

not known. More studies are required to understand the intra-seasonal variability of rainfall over Sri Lanka and to examine the skill of its predictions using NWP models.

7.3. **Inter-annual variations**

A detailed analysis of year to year variations of NE monsoon over Sri Lanka is discussed in this section. There are only a few studies on the inter-annual variability of NE monsoon rainfall over Sri Lanka.

Suppiah (1996) studied the spatial and temporal variations in the relationships between the Southern Oscillation Index (SOI) and rainfall over Sri Lanka. Major changes in spatial patterns of correlations between seasonal rainfall and the SOI have occurred in Sri Lanka during the Southwest monsoon (SWM) and Second inter-monsoon (SIM) seasons. The periods of strong positive (negative) correlations during the SWM season coincide with weak (strong) negative correlations during the SIM season. This contrasting pattern is clear when the Indian and Sri Lankan summer monsoon rainfalls were out of phase between 1900 and 1960, but not before 1900, or after 1960. The sudden change in correlations around 1960 suggests a change in the coupled ocean–atmosphere system that dominates the climate of these regions.

Suppiah (1997) studied the extremes of the Southern Oscillation (SO) Phenomenon over the equatorial Pacific and Sri Lanka rainfall. There were 27 El Niño and 22 La Niña events, during the period from 1881 to 1990. Positive and negative rainfall anomalies during the south-west monsoon (SWM) season are associated with La Niña and El Niño events, but negative and positive rainfall anomalies are linked to La Niña and El Niño events during the second intermonsoon (SIM) season. These contrasting patterns are dominant in the dry zone of Sri Lanka.

Zubair and Ropelewski (2006) reported that the relationship between ENSO and the northeast monsoon (NEM) in south peninsular India and Sri Lanka from October to December has not weakened. The mean circulation associated with ENSO over this region during October to December does not show the weakening evident in the