Identification of Earthquakes in the city of Londrina/Paraná through cross correlation
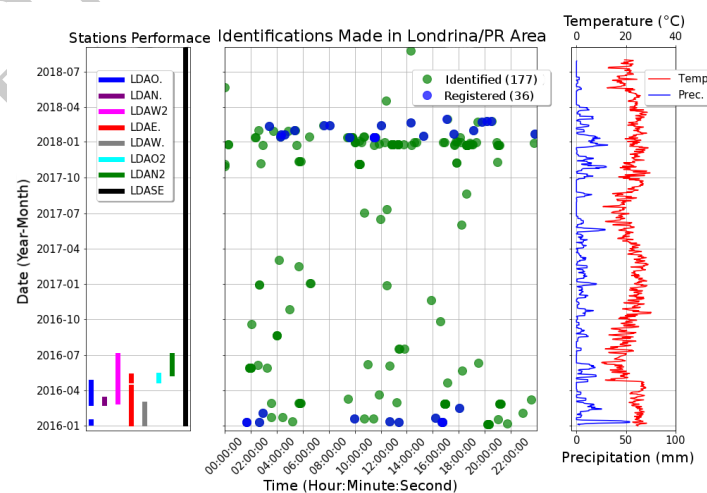
Leonardo Fabricius Silva[*1] and Marcelo Belentani de Bianchi[1]

[1]*Universidade de São Paulo (USP)*

Abstract

Since 2016 city of Londrina/PR has observed recurrent seismicity, being composed of 36 known events recorded by a local network, that operated for only a few months, and a permanent station (LDASE). In comparison to Taquaritinga and Bebedouro areas, Londrina seismicity presents a smaller number of events and lower magnitudes that raises two different hypotheses: (1) There is a significant difference between geologies between Londrina and Bebedouro/Taquaritinga, that would cause the observed differences; (2) There are many earthquakes still not identified in Londrina due to the observed small magnitudes and noise records. To address these hypotheses, we try to identify new events in the region taking the 36 know events as templates in an automatic procedure. The work developed included: (1) Manual interpretation of know events phases; (2) Automatic classification of know events into families of similar waveforms using a self-developed program; (3) Search the continuous records of LDASE station using the cross-correlation of already classified families and (4) comparison with the amount of rain near the area. The 36 earthquakes resulted in 31 distinct families with a minimum similarity of 80% between elements. Those Families have identify another 177 possible tremors, 160 of undetermined origin, 15 possible earthquakes and two confirmed earthquakes through a localization routine using Hypo71 software in conjunction with the NewBR model. As observed in other areas a comparison with the amount of rain in the period indicate that all signals are temporal related to an increasing amount of rain close to the region. Considering the number of new events identified most probably the recurrent seismicity in the city of Londrina is caused by a slightly different mechanism than those in Bebedouro and Taquaritinga. Smaller magnitudes, lower number of events and the small delay with the rainy periods favors shallower than Bebedouro/Taquaritinga seismicity in the area.