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# Disrupted Solar Transit at 140 MHz over the Mexican Array Radio Telescope due Space Weather Events

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## Abstract

In this work we present the records of the disrupted solar transits at 140 MHz at Mexican Array Radio Telescope (MEXART) related with active regions and a solar flare during the week of June 20 - 26, 2015.

## 1 Introduction

The transit instrument Mexican Array Radio Telescope (MEXART) is located in Coeneo, Mexico. Their main propose is record extra-galactic radio source to observe the interplanetary scintillation (IPS) [3]. The radio telescope have central frequency of 139.65 MHz and bandwidth of 2 MHz [2]. The MEXART radio telescope records solar transits of the Sun every day as part of their rutinary duties. The antenna pattern of the Sun transit is well determinate.

## 2 Space Weather conditions

The week between 20 and 26 of June, 2018. a series of events related with Space Weather were detected [4, 5]. An full analysis of these events can be found in [1]. In particular, on 22 June, 2015 at 18:23 UTC a M6 X-ray solar flare reaches to maximum flux in the X-ray band. [5].

## 3 Observations at MEXART

The set of solar events observed during 20 and 26 June, 2015 modifies the antenna pattern related with the solar transit during this week. The maximum disruption occurs at June 22 during a M6 solar flare detected in X-ray band.

The figure 1 shows the solar transits centered at peak from June 20 to June 24, 2015. We observed clearly changes in amplitude in the solar transit not only in the mean beam, we observed 14 lateral beams with a major response. The biggest response was at June 22, 2015.

Figure 3 show the disruption in antenna patterns at 4th and 5th left lobes (right to left). The transit at June 22 (red line) for the 4th lobe looks saturated. We used the 5th lobe to characterize the changes. In Figure 4 we plot the amplitude at peak for the solar transits.

Figure 2 show two solar transits centered at peak, for 22 (green line, quiet) and 26 (blue line, close to the solar flare) June, 2015. We observed clearly the changes of amplitude of the signal.

## 4 Conclusions

We show that space weather, in particular solar flares, modifies the antenna pattern related with solar transit in the MEXART at 140 MHz. The increase in the flux saturated the instrument at June 22. For this reasson, we used the 5Th lateral left lobe to characterize the increase of the flux. We observed that at peak, the flux increases 16 mV in the maximum level at June 22, 2015 compared against the baseline of the transit in quiet conditions.

## 5 Figures and Tables

### 5.1 Figures

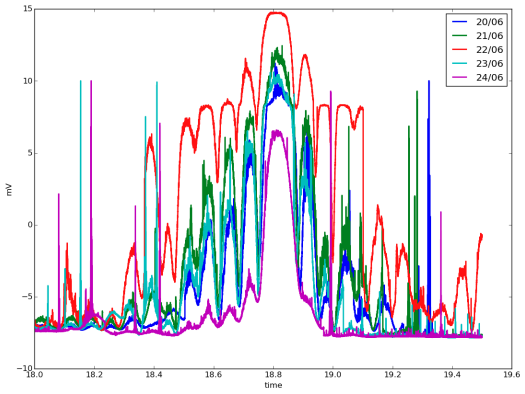


**Figure 1.** Disturbed antenna pattern at MEXART from June 20 to June 24, 2015.

## 6 Acknowledgments

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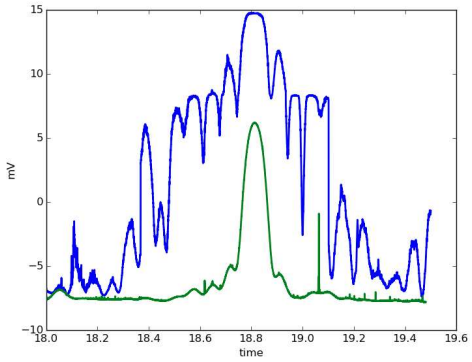


**Figure 2.** Difference between quiet antenna pattern using Sun transit at June 26, 2015 (green) and closest transit at flare time 22 June, 2015 (blue).

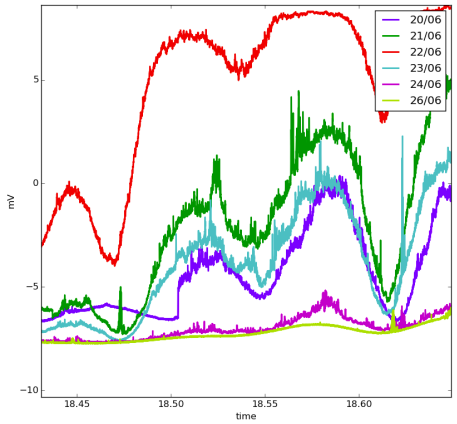


**Figure 3.** Flux at 5Th left lobe of the MEXART radio telescope from June 20 to June 26, 2015.

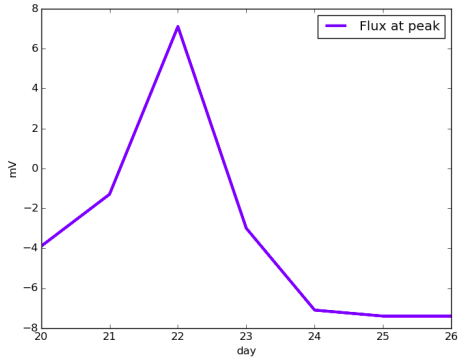


**Figure 4.** Flux at peak of the 5Th left lobe of the MEXART radio telescope from June 20 to June 26, 2015.

## References

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[5] SWPC: SWPC PRF 2078, 2015c.