URSI AP-RASC 2019, New Delhi, India, 09 - 15 March 2019

Solar Cycle Variation of Microwave Polar Brightening as Potential tool for Cycle Prediction

Sujin Kim[(1),(2)]
(1) Korea Astronomy and Space Science Institute, Daejeon, South Korea, e-mail: sjkim@kasi.re.kr
(2) University of Science and Technology, Daejeon, South Korea

The long-term variability of the sun has been studied to understand the solar dynamo and assess its potential for space weather prediction. Sunspot number has been used to anticipate following solar cycle, but recently polar magnetic field strength has been considered as a proxy to predict following solar cycle based on the Bobcock-Leighton mechanism (see [4]). There are various activities near the poles changed depending on solar cycle, such as polar faculae, filaments coronal holes, and so on. It seems that those activities have physical relationship with the polar magnetic field.

The Nobeyama Radioheliograph has taken full-sun images at 17 GHz from 1992 July to present. It gives a unique chance to look into the solar cycle variation of radio brightness temperatures at all heliographic latitudes over two solar cycles. The microwave butterfly diagram using NoRH 17 GHz synoptic map was presented for the first time in [1] and they pointed out the appearance of "polar brightening". The microwave polar brightening (hereafter MPB) is enhanced than brightness on quiet sun during solar minimum. Interestingly, comparing the MPB in NoRH 17 GHz to the appearance of polar coronal holes (CHs) in EUV images for solar cycles, one can find positive correlation between of them [3]. Also, it has been found that the MPB is consistent with the strength of the polar magnetic field during solar cycle [2][4]. However, the mechanism of MPB is still no known

Here, I review recent studies on microwave polar brightening in two solar cycles and discuss its potential to predict following solar cycle.

1. Kiyoto Shibasaki "Radio Synoptic Maps and Polar Cap Brightening," *ASP Conference Series*, **140**, 1998, p373

2. Gopalswamy 2012 "Behavior of solar cycles 23 and 24 revealed by microwave observations," *The Astronomical Journal Letters*, **750**, L42, May 2012, doi: 10.1088/2041-8205/750/2/L42.

3. Sujin Kim, Jong-Yeop Park, Yeon-Han Kim, "Solar cycle variation of microwave polar brightening and EUV coronal hole observed by Nobeyama Radioheliograph and SDO/AIA," *Journal of the Korean Astronomical Society*, 50, July 2017, pp. 125-129, https://doi.org/10.5303/JKAS.2017.50.4.125

4. N. Gopalswamy, P. Make, S. Yashiro, S. Akiyama, "Long-term solar activity studies using microwave imaging observations and prediction for cycle 25," *Journal of Atmospheric and Solar-Terrestrial Physics*, 176, April 2018, pp. 26-33, https://doi.org/10.1016/j.jastp.2018.04.005