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東北大学太陽電波望遠鏡 AMATERAS で観測された狭帯域太陽電波 Type-IV バーストとその生成機構
Study of the slowly drifting narrowband structure in type-IV solar radio bursts observed by AMATERAS

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We show the type-IV burst event observed by AMATERAS on June 7, 2011, and reveal that the main component of the burst was emitted from the plasmoid eruption identified by the EUV images of SDO. The slowly drifting narrowband structure (SDNS) appear in the spectra of the burst. By a statistical analysis, we reveal that SDNS appeared with the duration of tens to hundreds of millisecond and with the typical bandwidth of 3 MHz. For the generation mechanism of SDNS, we propose the wave-wave coupling between Langmuir waves and whistler-mode chorus emissions generated in a post-flare loop, inferred from the similarities of the plasma environments between a post-flare loop and the equatorial region of the Earth's inner magnetosphere. We assume that a chorus element with a rising tone is generated at the loop-top of a post-flare loop. By referring to the propagation properties of chorus in the magnetosphere, we assume that the chorus element propagates downward along the magnetic field line and then propagates away from the central region of the flare-loop toward the outer edge of the loop where the plasma density is relatively small. By the magnetic field and plasma density models, we quantitatively estimate the expected duration of radio emissions generated through the coupling between Langmuir waves and chorus during its propagation in the post-flare loop and find that the observation properties of duration and bandwidth of SDNS are consistently explained by the proposed generation mechanism. The characteristics of SDNS are its intermittency in time and the negative frequency drift in the limited frequency band. While observation in the terrestrial magnetosphere shows that chorus is a group of large amplitude wave elements naturally generated intermittently, the mechanism proposed in the present study can explain both intermittency and slowly drifting narrowband structure in the observed spectra.

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