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High speed camera campaign at Lulin observatory in Taiwan

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The high-speed camera system was used to conduct the Taiwan Lulin 2018 campaign. The observation system consists of two instruments: Sigma 20 mm camera with phantom high-speed camera bore-sighted with 12 mm camera Watec 902h low-light-level CCD. We use the GPS timestamp with time accuracy 0.1 ms. The trigger method provided by a high-speed camera is manual while 12 mm camera is auto-recorded by software in the computer. The observation site is located at the Lulin observatory (120° 52’ 25" E, 23° 28’ 07"N) at an altitude of 2,862 m in Taiwan. The campaign period was May 18-20 in 2018. A total number of recorded sprites is more than 300 events where high-speed camera recorded about 94 events. The high-speed camera results can also provide observational evidence of sprite re-brighten while computer simulations will evaluate and validate the feasibility of proposal detailed processes for sprite streamer re-brighten event. Hence, we simulate the sprite streamer with three initial configurations for irregular plasma in the middle atmosphere: (A) positively charged ions only, (B) negatively charged electrons only, and (C) co-existence of positively charged ions and negatively charged electrons. The aid of observations and theoretical studies using computer simulation may help us to reveal the detailed process and fine structure of sprite initiation, and to analyze the continuing emission in sprite streamer and re-ignited process to develop a new structure of sprites.