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PUNCTUAL LAUNCH STRATEGY RESEARCH OF TYPHOON RESPONSE FOR MARS  
EXPLORATION MISSION WITHIN ANNUAL LAUNCH WINDOW

**Abstract**

Mars, located in the habitable zone of the solar system, is considered to be the preferred target for human beings to walk out of the Earth-Moon system, and has long been the hot spot and focus of deep space exploration. The Mars exploration windows in 2020-2022 coincide with typhoon season of the northern hemisphere, and all international Mars exploration missions are at risk of encountering typhoon in launch complex. The launch window interval of Mars exploration mission is as long as 26 months, in order to make full use of the annual launch opportunity, it is necessary to study the typhoon emergency response strategy in launch complex. In view of the Tianwen-1 mission, which is the first Mars exploration mission of China, the punctual launch strategy research of typhoon response within annual launch window is investigated. Firstly, based on the brief introduction of test and launch process in launch complex, the meteorological support strategy and influence analysis of typhoon are studied. Secondly, in response to the situation of return to the technical area because of typhoon influence, the research on reverse process emergency disposal of launch complex is carried out. Thirdly, the process optimization research of re-entering launch complex is implemented by process optimization of countdown dress rehearsal and nitrogen purge of tank. Finally, the process re-planning and decision-making strategy for typhoon response is investigated. The research results show that the punctual launch strategy has improved the launch opportunity within the annual launch window from the original one to more than two times, for the case that encountering single typhoon even the extreme case that encountering binary typhoon in launch complex.