

RTK and PPK: GNSS-Technologies for Direct Georeferencing of UAV Image Flights

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SUMMARY

The UAV DJI Phantom 4 (and previous models) has been available on the market for more than 10 years. In its current version "RTK" (Real-Time Kinematic) it is equipped with a 2-frequency GNSS receiver. In combination with a reference station or alternatively by using real-time correction services (e.g. the SAPOS-HEPS service in Germany), precise positioning in real-time kinematic mode is possible. Since the system also provides raw data in RINEX format, positioning can also be carried out using PPK (Post-Processed Kinematic). This offers extended possibilities for georeferencing UAV image flights.

In the context of this paper investigations on the geometric accuracy of UAV image flights, recorded with four different DJI Phantom 4 RTK systems under defined conditions on the UAV test field "Zollern colliery", are performed. The following evaluations were executed with identical parameterization by the software Agisoft Metashape. The present results show the partly strong variations in the quality of the measured RTK positions and their effects on the image orientation and involved parameters. A final comparison between the use of the RTK measurements and those from a post-processing (PPK) does not show a recognizable improving in accuracy for the investigated image blocks. In spite of that PPK is an important method in case of non-available real-time corrections.

Finally, recommendations are given for reasonable configurations of the georeferencing of UAV image flights, depending on the applications.