Network RTK methods could be divided into three stages of development: Network RTK based on differential corrections has been widely used since it was proposed in the mid-1990s. Users obtain position using relative-positioning mode. High resolution ionospheric modeling technique (HiRIM) was proposed by Christian Rocken in 2000, which realized modeling for each satellite separately, but users should only apply relative-positioning mode. Network RTK based on un-differenced corrections was put forward by Ge Maorong in 2010. It could not only realize modeling for each satellite, but also provide users with rapid precise positioning service under PPP mode, which is proved equivalent with Network RTK method under relative-positioning mode in this paper.

The above Network RTK methods have similar mathematical principal in certain conditions with differences only in detailed implementation. This paper investigates the relationship and differences between these methods from the aspect of algorithm, analyzes and summarizes their inner heritage and evolution relationship. Then the equivalences among these methods in certain conditions are given together with corresponding theoretical proofs. After that, we analyze the technological break-through of realizing Network RTK under PPP mode based on un-differenced corrections, and demonstrate the feasibility on the unification of regional Network RTK and wide area PPP.

We have realized Network RTK based on un-differenced corrections method and validated it using true dynamic data with the average distance of 185 km between reference stations. Experimental results show that only several minutes are needed to obtain rapid precise positioning of cm-level under PPP mode.