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From jimr@maia.usno.navy.mil Mon Jul 31 10:21:08 EDT 2000
Received: (from jimr@localhost)
        by maia.usno.navy.mil (8.9.3 (PHNE_18979)/8.9.3) id KAA04129
        for gpst@maia; Mon, 31 Jul 2000 10:17:36 -0400 (EDT)
From: Jim Ray (USNO 202-762-1444)
Message-Id: <200007311417.KAA04129@maia.usno.navy.mil>
Subject: [GPST] USNO Ultra-rapid clock predictions
To: gpst@maia.usno.navy.mil
Date: Mon, 31 Jul 2000 10:17:36 EDT
X-Mailer: Elm [revision: 212.5]
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Forwarded message (for those who do not get IGS Mail):


From: Jim Ray (USNO 202-762-1444)
Subject: [IGSMAIL-2962]: USNO Ultra-rapid clock predictions
To: igsmail@igscb.jpl.nasa.gov
Date: Mon, 31 Jul 2000 9:53:24 EDT

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IGS Electronic Mail      31 Jul 06:53:35 PDT 2000      Message Number 2962
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Author: Jim Ray

The USNO analysis group has begun to report predicted clock estimates
in our sp3 submissions for the IGS Ultra-rapid (IGU) combinations.  These
began with the predicted products for 26 July 2000.  The IGS Ultra-rapid
products are under development as described in the position paper by
G. Gendt, P. Fang, and J. Zumberge presented at the Analysis Workshop
at SIO in June 1999; they are not yet "official" but will become so
in the near future.

The procedure used for our clock predictions is to extrapolate the
estimated satellite clock values from the observational data preceding
the prediction period.  The extrapolations use fits for the following
models:
      linear + sinusoid              for satellites with Cs clocks
      quadratic + sinusoid           for satellites with Rb clocks
where the period of the sinuoid equals the orbital period.  Some
satellite clocks show very pronounced sinusoidal variations (most
prominently PRN06) while most show little.  Continuity between the
observed clocks and the predictions is enforced.  If the RMS of the fit
to the observed clock of any satellite exceeds 5 ns, then no clock
predictions are reported for that satellite.  I would like to acknowledge
the helpful advice of Arthur Dorsey (Lockheed Martin Corp.) in designing
this strategy, as well as Steven Hutsell (USNO/Colorado Springs) in
pointing out the significant sinusoidal variations.

The USNO clocks are estimated relative to the clock state of a chosen
tracking receiver (equipped with a H-maser external standard), which is
not adjusted as the reference.  Following standard practice for other IGS
clock products, all submissions in the IGU combination are aligned to
GPS broadcast time by removing an overall linear trend based on the
observed period.  Note that these referencing procedures can cause
occasional problems for both our observed and predicted clocks when the
chosen reference clock suffers a reset or when a satellite clock is reset.
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Users are cautioned that these clock products should be regarded as
experimental. Further evaluations and refinements will be made. It
is important to note that until other analysis centers contribute to
the IGU clock combination these products will not be as reliable or
as robust as other IGS products. Given the rapid progress already
demonstrated for the IGU orbits, the clock development is also likely
to be rapid. With the ending of Selective Availability on 02 May, it
should be possible to produce clock predicions at the few-nanosecond
level, although it remains to realize and demonstrate this potential.