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From owner-igsmail@igscb.jpl.nasa.gov Tue May  9 13:04:19 EDT 2000
Received: from igscb.jpl.nasa.gov (IDENT:root@igscb.jpl.nasa.gov [137.79.24.21])
        by maia.usno.navy.mil (8.9.3 (PHNE_18979)/8.9.3) with ESMTP id NAA22328;
        Tue, 9 May 2000 13:04:18 -0400 (EDT)
Received: (from majordomo@localhost)
        by igscb.jpl.nasa.gov (8.9.3/8.9.3) id JAA02680
        for igsmail-outgoing; Tue, 9 May 2000 09:38:40 -0700
X-Authentication-Warning: igscb.jpl.nasa.gov: majordomo set sender to owner-igsmail using -f
Received: (from mkenney@localhost)
        by igscb.jpl.nasa.gov (8.9.3/8.9.3) id JAA02674
        for igsmail@igscb.jpl.nasa.gov; Tue, 9 May 2000 09:38:40 -0700
Received: from mailhub.unibe.ch (mailhub.unibe.ch [130.92.254.109])
        by igscb.jpl.nasa.gov (8.9.3/8.9.3) with ESMTP id HAA29951
        for ; Tue, 9 May 2000 07:48:24 -0700
Received: from CONVERSION-DAEMON by mailhub.unibe.ch (PMDF V5.2-32 #42480)
 id <0FUA00601RNRG3@mailhub.unibe.ch> for IGSMAIL@igscb.jpl.nasa.gov; Tue,
 9 May 2000 16:45:34 +0200 (MET DST)
Received: from sauron (sauron.unibe.ch [130.92.6.10])
 by mailhub.unibe.ch (PMDF V5.2-32 #42480)
 with SMTP id <0FUA002M8RNQ2Y@mailhub.unibe.ch> for IGSMAIL@igscb.jpl.nasa.gov;
 Tue, 09 May 2000 16:45:27 +0200 (MET DST)
Date: Tue, 09 May 2000 16:47:34 +0100
From: sschaer@ubeclu.unibe.ch (Stefan Schaer)
Subject: [IGSMAIL-2827]: Monitoring (P1-C1) code biases
To: IGSMAIL@igscb.jpl.nasa.gov
Message-id: <00050916473409@sauron.unibe.ch>
X-VMS-To: IGSMAIL_
X-VMS-Cc: SSCHAER
MIME-version: 1.0
Content-type: TEXT/PLAIN
Content-transfer-encoding: 7BIT
Sender: owner-igsmail@igscb.jpl.nasa.gov
Precedence: bulk
Status: RO

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IGS Electronic Mail      09 May 09:38:40 PDT 2000      Message Number 2827
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Author: Stefan Schaer


Dear colleagues:

Starting with GPS week 1056, the IGS analysis centers have to take (P1-C1) code
biases into account in order to ensure that their precise clock information is
fully consistent to P1/P2 code measurements. Background and details may be
gathered from IGS Mails 2320 and 2744 at

  http://igscb.jpl.nasa.gov/mail/igsmail/1999/msg00564.html
  http://igscb.jpl.nasa.gov/mail/igsmail/2000/msg00084.html

CODE is accounting for this type of code biases as from GPS week 1057. It might
be interesting for some of you that CODE solves for satellite-specific
differential code bias (DCB) parameters as part of the clock estimation
procedure. Our approach works as long as a mixture of data of cross-correlation
style receivers and modern receivers is processed. At present, about 30-40 of
80 stations in all used for the clock estimation may be related to a cross-
correlation style receiver providing C1 and P2' code measurements. The
improvement of our clock estimates due to the mentioned measure is clearly
detectable.

The day-to-day repeatability of our daily (P1-C1) DCB estimates is of the order
of 0.08 nanoseconds and 25 millimeters, respectively. Following the square-
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root-of-N law, the weekly combined estimates should show an uncertainty of approximately 0.03 nanoseconds and 10 millimeters, respectively. A first comparison of three 7-day DCB combinations confirms this accuracy. We refer in the following to our ionosphere-dedicated website

  http:/www.aiub.unibe.ch/ionosphere.html

where we already put some (P1-P2) DCB results, a by-product of the TEC determination. Let us briefly highlight the most important (P1-C1) DCB files automatically updated:

  http://www.aiub.unibe.ch/ionosphere/lastweek_p1-c1.dcb - gives the DCB values of a moving 7-day combination. Note that the rms values listed correspond to the daily repeatabilities (and not to the rms errors of the combined values).

  http://www.aiub.unibe.ch/ionosphere/dcb_p1-c1.ps - visualizes the moving 7-day combination. Red dots indicate the daily estimates; the green circles indicate the combined values.

  http://www.aiub.unibe.ch/ionosphere/dcb_p1-c1_ref.ps - shows our accumulated daily DCB solutions and compares these to the values provided by Muellerschoen from JPL and adopted by the IGS (indicated by green circles). The agreement is pretty good. For some PRNs, however, significant deviations may be seen. Let us mention PRN 08 as a prominent example. It remains questionable whether these differences may be explained with the different observation epochs, remembering that Muellerschoen's results were derived at the beginning of this year.

  http://www.aiub.unibe.ch/ionosphere/dcb_p1-c1_wk1057ff.ps - this figure demonstrates the internal consistency of our weekly solutions on a level of 30 picoseconds rms.

We will continue in monitoring these code biases since they are not as constant as one might like - and since several launches of new GPS spacecrafts are announced for the near future. Our daily (P1-C1) DCB estimates are available on special request. The same is valid for long-time combinations which may be generated very easily.

For the user of IGS precise clock information, it remains important to realize that the knowledge of (P1-C1) and/or (P1-P2) code biases allows them to transform the P1/P2-consistent clock estimates to clock estimates which are consistent to the ionosphere-free linear combination of code observations provided by cross-correlations style receivers, or, in the single-frequency case, to C/A code observations. It is obvious that corresponding clock corrections may be also derived for other combinations, if desired.

Best regards,

The CODE AC Team