2) DATA ANALYSIS

2.1) ITRF91 station coordinates

The ITRF91 station coordinates solution consists of a combined adjustment of station positions and transformation parameters for the epoch 1988.0.

The adjustment were performed using the SSCMIX software developed by IGN. The options used were:

- reduction of individual data sets at a common epoch,
- least square estimation of station coordinates and 7 transformation parameters for each solution,
- local surveys used with a priori variances (see 1.4)
- station coordinates used with a priori variances (see 1.3)

It was decided that:

- origin should come from SLR
- scale should also come from SLR noting that the scales of some VLBI solutions (GSFC, NOAA and NAOMZ) are consistent with SLR,
- orientation should be such that no global rotation should exist with respect to ITRF90.

To ensure that, a first global adjustment of all selected data was done, holding the LC91 transformation parameters fixed to zero. The solution was labelled ITRF91A.

Then ITRF91A was compared to ITRP90 in order to estimate corrections to rotation angles. This comparison has been done incorporating only one point per site. Table 2 gives the transformation parameters between ITRF91A and ITRF90. The global adjustment was finally repeated with LC91 translation and scale put to zero and rotation angles fixed to the values derived from the previous computation.

<table>
<thead>
<tr>
<th>T1 cm</th>
<th>T2 cm</th>
<th>T3 cm</th>
<th>D 10^-8</th>
<th>R1 0.001&quot;</th>
<th>R2 0.001&quot;</th>
<th>R3 0.001&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.1</td>
<td>0.4</td>
<td>1.5</td>
<td>-0.02</td>
<td>-0.4</td>
<td>0.4</td>
<td>-0.9</td>
</tr>
<tr>
<td>±0.2</td>
<td>±0.2</td>
<td>±0.2</td>
<td>±0.03</td>
<td>±0.1</td>
<td>±0.1</td>
<td>±0.1</td>
</tr>
</tbody>
</table>

2.2) ITRF91 velocity field

The ITRF91 velocity field has been obtained by combination of several site velocity fields estimated by SLR and VLBI analysis centers. This has been elaborated using an equivalent
method as the combination of SSC to produce the ITRF91 and consistent with it. NUVEL-1 NNR has been selected as a reference motion model and it was included in the global adjustment of the ITRF91 velocity field. The original formal errors given by the analysis centers in their individual solutions have been modified in order to obtain a realistic combined velocity field, while an error of 3 mm has been used for NUVEL-1 NNR velocities. Some NUVEL-1 NNR velocities have been deweighted in the combination (with 10 cm as apriori sigma). This concerns sites whose motion may differ from that given by NUVEL-1 NNR, such as sites in California, Japan and in the Mediterranean area. The same weighting formula (1) as for SSC has been used for velocity fields. The values of A and B attributed to the velocity fields are given in Table 5.

3) RESULTS

3.1) Values

We have adjusted combined coordinates in the ITRF91 solution for epoch 1988.0. They are given in Table T6 under the label SSC(IERS) 92 C 01. They are also published in Table T-3 of the IERS Annual Report for 1991.

The adjusted transformation parameters were published in Table T-2 of the IERS Annual Report for 1991. They are also available in Table T7 of the appendix.

Table T8 gives the rate of change of the translation and rotation parameters. The scale factor is assumed to be invariant with time. These values have to be considered as annual variations to the transformation parameters given in Table T7. So for a given transformation parameter $T$ at an epoch $t$ in years, we have:

$$T(t) = T(1988.0) + \dot{T} \cdot (t - 1988.0)$$

$\dot{T}$ and $T$ are given in Tables T7 and T8 respectively. When $\dot{T}$ is not given one can assume $\dot{T} = 0$.

Table T9 lists the ITRF91 combined velocity field. These velocities should be used to refer the ITRF91 coordinates from the 1988.0 epoch to another desired epoch. This Table gives for each site its DOMES number, name, the individual solutions in which its velocities are available, the cartesian velocities and their standard deviations, the plate and a code: CN for Combined Velocities with NUVEL-1 NNR, C for Combined velocities with NUVEL-1 NNR velocities deweighted, and N for NUVEL-1 NNR velocities.

3.2) Analysis of results

The factor of unit variance is 1.5 for both the ITRF91 station coordinates and velocity field combined solutions. Although it is close to 1, the proper weighting in the combined adjustment is a rather critical and delicate problem.

For a sample of 6 stations covering the Earth, Figures 17 to 22 show the evolution of their position in the local frame, from ITRF0 to ITRF91.