

**Information Sheet**  
**on the**  
**new International Measurement Standards**  
**VSMOW2 and SLAP2**

**VSMOW2** Vienna Standard Mean Ocean Water 2  
**SLAP2** Standard Light Antarctic Precipitation 2

The two reference materials VSMOW2 and SLAP2 were produced to replace the exhausted reference materials VSMOW and SLAP. Their isotopic compositions for both  $\delta^2\text{H}$  and  $\delta^{18}\text{O}$  were adjusted to be as close as possible to the predecessor materials. The reference values were assessed from data measured by three laboratories in a calibration exercise measuring the  $\delta^2\text{H}$  and  $\delta^{18}\text{O}$  data of VSMOW2 and SLAP2 in direct reference to those of VSMOW and SLAP (Table 1). The stated combined standard uncertainties are evaluated from the measurement uncertainties in the laboratories for the involved materials and the assessment of isotopic homogeneity of the prepared ampoules of VSMOW2 and SLAP2.

**Table 1:  $\delta^2\text{H}$  and  $\delta^{18}\text{O}$  reference values for the two international measurement standards VSMOW2 and SLAP2 and their associated combined standard uncertainties.**

| IAEA name     | Material | Reference value<br>$10^3 \delta^2\text{H}_{\text{VSMOW/SLAP}}$ | Combined standard uncertainty<br>$10^3 \delta^2\text{H}_{\text{VSMOW/SLAP}}$ | Reference value<br>$10^3 \delta^{18}\text{O}_{\text{VSMOW/SLAP}}$ | Combined standard uncertainty<br>$10^3 \delta^{18}\text{O}_{\text{VSMOW/SLAP}}$ |
|---------------|----------|--|--|---|---|
| <b>VSMOW2</b> | Water    | <b>0.0</b>   | <b>0.3</b>   | <b>0.00</b>   | <b>0.02</b>   |
| <b>SLAP2</b>  | Water    | <b>-427.5</b>  | <b>0.3</b>   | <b>-55.50</b>   | <b>0.02</b>   |

In order to calibrate and normalize any measurement to the VSMOW – SLAP scale (especially for the calibration of internal laboratory water standards), one uses the formula below (Gonfiantini, 1978). In that formula the measured values for the new international measurement standards VSMOW2 and SLAP2 have to be entered instead of those of VSMOW and SLAP, as well as the corresponding new calibrated  $\delta_{\text{SLAP2}}$  value for SLAP2 from Table 1:

$$\delta = ((R_{\text{sample}} / R_{\text{VSMOW2}}) - 1) \cdot \delta_{\text{SLAP2}} / ((R_{\text{SLAP2}} - R_{\text{VSMOW2}}) / R_{\text{VSMOW2}})$$

By using this procedure all data are still reported on the VSMOW/SLAP scale, despite the use of VSMOW2 and SLAP2 for their calibration. Of course the standard uncertainties of VSMOW2 and SLAP2 isotopic values should be included as uncertainty component in any combined uncertainty statement of measurements performed.

It is recommended to clearly state in any publication, that the calibration was performed using VSMOW2 and SLAP2.

IAEA Isotope Hydrology Laboratory, 20 June 2007