DOCUMENTATION OF STATION/AGENCY MAGNITUDE PROCEDURES

(Modified from the SUMMARY OF IASPEI MAGNITUDE WORKING GROUP RECOMMENDATIONS ON DETERMINING EARTHQUAKE MAGNITUDES FROM DIGITAL DATA, updated version 2011; see http://www.iaspei.org/commissions/CSOI/Summary_WG-Recommendations_20110909.pdf)

This documentis to outline the procedures adopted by seismological agencies to compute magnitudes of seismic events.

Agency Name: Venezuelan Foundation for Seismological Research (FUNVISIS)

Please list the magnitudes computed and corresponding phase type analyzed in the table below (example provided). Add as many rows as required.

Magnitude type(nomenclature used at the agency)	Full name	Wave type analyzed
Mw (2003 - Present)	Broadband Seismic Moment	P-S Waves

For each magnitude type computed at the agency, please specify:

1. The equations that are used for calculating each magnitude type and a:specify if distance is measured as epicentral distance or hypocentral distance;

    Equation used for magnitude is (Havskov and Ottomoller, 2011):

$$Mw = \frac{2}{3}\log(M_O) - 6.07$$

    for hypocentral distance.

    b: specify the distance range for which the equation is applied;

    (0 – 1000) km

    c: specify restrictions on hypocentral focal-depth, if any.

    We make no restrictions.

2. Is any signal-to-noise ratio criterion applied to the analyzed signal?

No, the signals with high noise signals are not used in the scheme.

3. Specify the softwareused (such as SeisComp, Antelope, Seismic Handler,Seisan,SAC, in-house developed programs) to perform the analyses for magnitude computation.

   The software used is Seisan

4. If the agency is computing magnitudes not based on some amplitude/period measurement (e.g., moment magnitude Mw) please summarize the details of the technique used. For example, is Mw obtained with a centroid moment tensor, W-phase and/or spectral fitting technique?

   Visual adjustment of the level at low frequencies to observed spectrum

5. Other restrictions on the calculation of a specific magnitude. For example, is the magnitude measured only for earthquakes of a certain size, as defined by an independent measure of earthquake size? Also, are specific magnitudes computed only for seismic events occurring in specific areas?

No restrictions on the computation of the magnitude on the size of the earthquake or area of occurrence.

Detailed questions on the magnitudesbased on amplitude/period measurements:

6. How the network (event) magnitude and corresponding uncertainty is obtained? For example, is the network magnitude an arithmetic/trimmed mean, median value of the single station magnitudes?

Does not apply

7. Units of the reported amplitudes. Specify if amplitudes are reported in units of trace-amplitude motion instead of ground motion.

Does not apply

8. Time-window in which the amplitude measurement is made for the phase type analyzed. For example, for body wave magnitudes, is the time window a flexible time-interval between the P onset and the PP onset or a fixed time window after the first P onset (e.g. 5 s, 10s or other)? Similarly, for the surface wave magnitudes, is the time window considered a time-interval

spanned by waves having group-velocities between, e.g., 3.2 and 4.0 km/s or is always the maximum velocity amplitude, respectively (A/T)max in the whole surface-wave train in a wide range of periods be measured? If so, give the range of periods.

Does not apply

9. Orientation of seismograph (horizontal or vertical) from which the measurement is made. For example, is Ms computed using both horizontal and vertical components? Specify also if, as for example might be the case for ML, data from each of the two horizontal components at a single station are used, are data from each component treated as a separate observation in the network magnitude computation, or are the two components first averaged into a station magnitude, which is then treated as a single observation in the network magnitude computation?

Does not apply

10. Describe the amplitude-response, filter characteristics, or transfer-function of the seismograph or simulated seismograph through which the amplitude measurement is made. For example, is the IASPEI recommended standard Wood-Anderson seismometer simulation filter with the parameters according to Uhrhammer and Collins (1990) used to compute ML?

Does not apply

11. Details of measuring amplitude:
   a: For example, does the amplitude correspond to 0.5*(peak-to-trough amplitude), where "peak-to-trough amplitude" corresponds to difference between a maximum positive excursion and a maximum negative excursion of the trace, or is the amplitude instead measured as the maximum absolute excursion from the "zero" position of the seismograph trace?
Does not apply
   b: for example, if the amplitude corresponds to 0.5*(peak-to-trough amplitude), are the "peak" and "trough" respectively the absolute maximum and absolute minimum values of the entire wave-group, or are they the adjacent peak and trough corresponding to the maximum trace excursion that is associated with a single zero-crossing?
Does not apply
   c: for example, are displacement amplitude(A) and period(T) measured at the time of maximum A or at the time of the maximum of the quotient (A/T)?

Does not apply

12. Details of measuring period.For example, is it the time between the neighboring peaks, respectively troughs or twice the time span measured between the largest peak and adjacent trough at which the double amplitude has been measured?

Does not apply

13. To what part of a phase the amplitude-measurement time refers. For example, is the amplitude-measurement time the time of the zero-crossing associated with a peak-to-adjacent trough measurement or is it the time of an absolute maximum or absolute minimum?

Does not apply

Finally, please add publications as well asinternal reports or web links that can be quoted to describe the magnitude procedures adopted at the agency and/or any other relevant information which may not have been included in the questions above.

Publications:
Rendón, H., Romero, G., Palma, M., Vásquez, R., Pérez, A., López, R., Pernía, A., 2009, **Caracterización Teórico-Práctica de la Calibración de la Red Sismológica Nacional**, IX Congreso Venezolano de Ingeniería Sísmica, Caracas, Venezuela.
Romero, G., Alvarado, L., Rendón, H., Vásquez, R., 2003, **Some aspects on the Venezuelan Seismicity pattern, 2000-2002, a contribution of the new broadband seismological network**, Seismological Society of America, Puerto Rico.

Internal Report:
Rendón, H., Alvarado, L., Vásquez, R. and Romero, G., 2014, **Depuración y actualización del Catálogo Sísmico Instrumental de Venezuela, BASEVEN, como producto previo al catálogo necesario en los estudios de amenaza sísmica**, Informe Técnico FUNVISIS Nro. FUN-056,2014.