Data for neutrino fluxes at production

The data for neutrino fluxes from DM annihilations in the Earth and in the Sun, computed in

M. Cirelli, N. Fornengo, T. Montaruli, I. Sokalski, A. Strumia, F. Vissani
"Spectra of neutrinos from dark matter annihilation"
hep-ph/0506298v5

can be downloaded from any of the following locations:
– www.to.infn.it/∼fornengo/DMnu.html
– www.cern.ch/astrumia/DMnu.html
– www.marcocirelli.net/DMnu.html

The neutrino fluxes at production are given in two forms:
1. as raw numerical tables of the fluxes;
2. as tables of fit parameters.

1. Numerical tables of the fluxes

The file `DMnuProdFluxes.zip` contains the following data files:

`earth_numu.dat`	fluxes of $\nu_\mu=\bar\nu_\mu=\nu_e=\bar\nu_e$ from annihilations in Earth
`earth_nutau.dat`	fluxes of $\nu_\tau=\bar\nu_\tau$ from annihilations in Earth
`sun_numu.dat`	fluxes of $\nu_\mu=\bar\nu_\mu=\nu_e=\bar\nu_e$ from annihilations in Sun
`sun_nutau.dat`	fluxes of $\nu_\tau=\bar\nu_\tau$ from annihilations in Sun

Each file is a table of the following format:

$$m_{\rm DM} \quad x \quad b \quad \tau \quad c \quad q \quad t \quad Z \quad W \quad Z(\text{no prompt}) \quad W(\text{no prompt})$$

where $m_{\rm DM}$ is the mass of the annihilating DM particle, $x = E_\nu/m_{\rm DM}$ is the rescaled neutrino energy and the other columns give the neutrino fluxes normalized per single DM annihilation for the annihilation channels $b\bar b$, $\tau\bar\tau$, $c\bar c$, light quarks ($u\bar u \equiv d\bar d \cong s\bar s$), ZZ, W^+W^-. The last two column give the neutrinos fluxes from the ZZ and W^+W^- channels having subtracted the "prompt" neutrinos (see the text of the paper). The values of $m_{\rm DM}$ provided

are the following. For the case of the Earth (14 values):

$$m_{\rm DM} = \{10, 30, 50, 70, 90, 100, 150, 200, 250, 300, 500, 700, 900, 1000\}\,{\rm GeV}.$$

For the case of the Sun (12 values):

$$m_{\rm DM} = \{10, 30, 50, 70, 90, 100, 200, 300, 500, 700, 900, 1000\}\,{\rm GeV}.$$

2. Tables of fit parameters

The file `DMnuProdParameters.zip` contains the following data files:

`parameters_fit_numu_earth.dat`
  fit parameters for $\nu_\mu = \bar\nu_\mu = \nu_e = \bar\nu_e$ from annihilations in the Earth
`parameters_fit_nutau_earth.dat`
  fit parameters for $\nu_\tau = \bar\nu_\tau$ from annihilations in the Earth
`parameters_fit_numu_sun.dat`
  fit parameters for $\nu_\mu = \bar\nu_\mu = \nu_e = \bar\nu_e$ from annihilations in the Sun
`parameters_fit_nutau_sun.dat`
  fit parameters for $\nu_\tau = \bar\nu_\tau$ from annihilations in the Sun

Each file provides the fitting parameters a_i, b and c_i to be used in the expression for the neutrino flux

$$\frac{dN}{dx} = g(x) = a_0(1 + a_1 w + a_2 w^2 + a_3 w^3 + a_4 w^4 + a_5 w^5)(1-x)^b + c_0 x^{c_1}(1-x)^{c_2}$$

$$x = E_\nu/m_{\rm DM}, \qquad w = \log_{10} x,$$

which corresponds to eq. (7) in the paper. The parameters are given as a table in the format

$$m_{\rm DM} \quad a_0 \quad a_1 \quad a_2 \quad a_3 \quad a_4 \quad a_5 \quad b \quad c_0 \quad c_1 \quad c_2$$

(where $m_{\rm DM}$ is the mass of the annihilating DM particle) for each of the following annihilation channels

$$\{\, b\bar b, \tau\bar\tau, c\bar c, \text{light quarks } (u\bar u \equiv d\bar d \cong s\bar s), \text{gluons} \,\}.$$

The values of $m_{\rm DM}$ provided are the following. For the case of the Earth (14 values):

$$m_{\rm DM} = \{10, 30, 50, 70, 90, 100, 150, 200, 250, 300, 500, 700, 900, 1000\}\,{\rm GeV}.$$

For the case of the Sun (11 values):

$$m_{\mathrm{DM}} = \{10, 30, 50, 70, 90, 100, 300, 500, 700, 900, 1000\}\,\mathrm{GeV}.$$

These data correspond to the data provided in Table 1 and Table 2 of the paper. See further discussion there.

Differences with Release 3
A bug in the production of the fluxes of <u>anti</u>-neutrinos after propagation from the Sun has been fixed. All other fluxes are unchanged.
The paper in the arXiv has not been updated (the figures would be affected by minor changes).

Differences between Release 3 and Release 2
A numerical bug in the implementation of the boost for top quark decays has been fixed (modifications are quite small; they affect the $t\bar{t}$ channels in Figures 2, 5 → 12, as well as in Tables 3 and 4 in the paper).
The present Release 3 corresponds to **v4** of the paper in the arXiv.

Differences between Release 2 and Release 1
An erroneous double counting of the prompt neutrino yield in W-boson decays has been fixed (modifications affect the W^+W^- and $t\bar{t}$ channels in Figures 2, 5 → 12, as well as in Tables 3 and 4 in the paper) and a few parameters have been updated (modifications are generally small or null).
Release 2 corresponds to **v3** of the paper in the arXiv. Previous versions on the arXiv and the journal version on Nuclear Physics B had used Release 1.