Advisory Group for the Ministry of Economic Affairs

TNO | Knowledge for business

TNO Built Environment and Geosciences
Geological Survey of the Netherlands
PO box 80015
3508 TA Utrecht
The Netherlands

The VELMOD-2 seismic velocity model of the Netherlands on- and offshore

VELMOD-2 is a layer cake model, with seismic velocities modeled per lithostratigraphic layer (Figure 1).

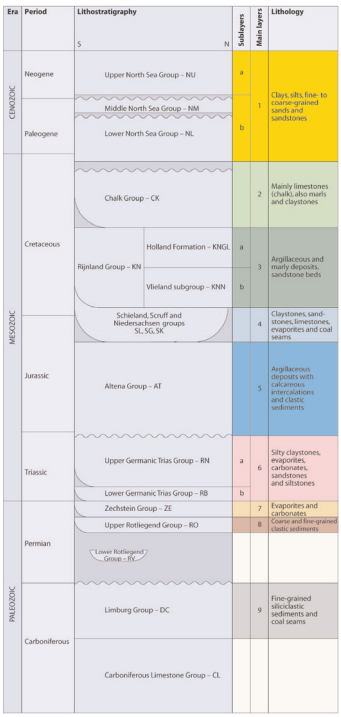

Figure 1. Lithostratigraphic layers of VELMOD-2

Main data sources for the model are lithostratigraphic depth data in DINO, the National Geo-data Centre of the Netherlands, and sonic logs of some 1300 boreholes (Figure 2).

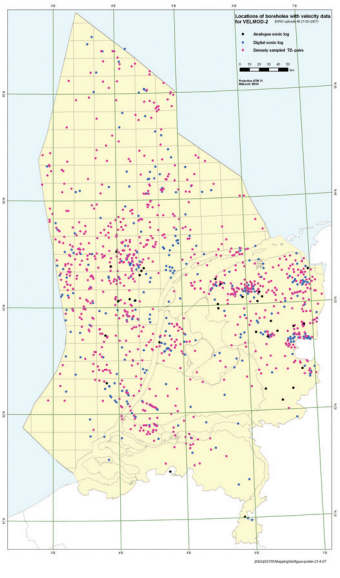

Figure 2. Borehole locations with sonic data available to VELMOD-2

All layers, except that of the Zechstein Group, are compacting layers. Their model velocities are assumed to increase linearly with depth:

$V(x,y) = V_0(x,y) + K \bullet z$

The model parameters K were derived from linear least squares relations between interval velocity V_{int} and mid-depth z_{mid} per layer (Figure 3).

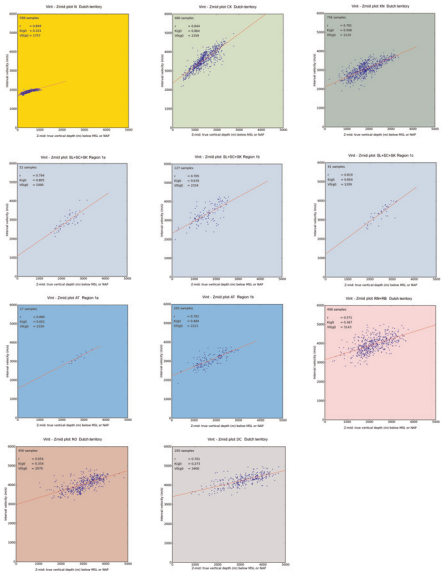

Figure 3 Linear least squares relations between V_{int} and z_{mid} for the main compacting layers of VELMOD-2

K-values are regionally constant for the layers of Jurassic age (Figure 4), or constant for the entire Dutch on- and offshore.

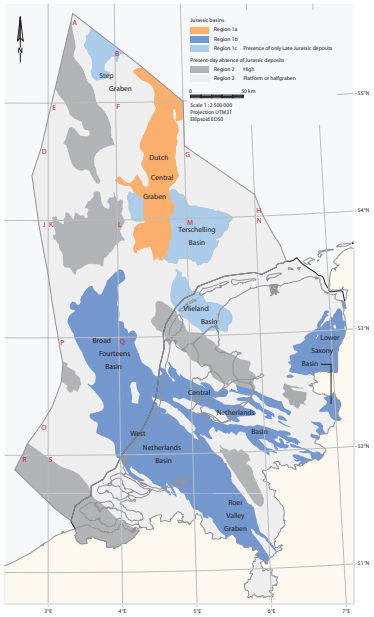

Figure 4. Regional subdivision of K for layers of Jurassic age

The position dependent parameter V_0 was determined at borehole locations and then kriged on a grid with cells of 1 km x 1 km. Determination of V_0 at borehole locations was effected by calibrating model traveltime through a layer to the traveltime according to the sonic data.

The velocity model for the non-compacting layer of the Zechstein Group consists of a grid of interval velocities, based on sonic data and seismic traveltime data.

Figure 5 shows the V_0-distribution for the layer of the Upper and Lower Germanic Trias groups, whereas the kriging standard deviation of this distribution is shown in Figure 6.

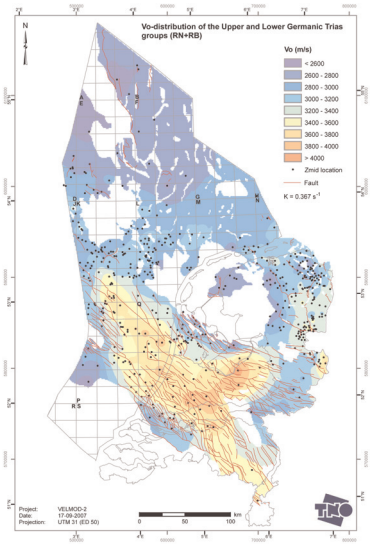

Figure 5. V_0-distribution (VELMOD-2) for the layer of the Upper and Lower Germanic Trias groups

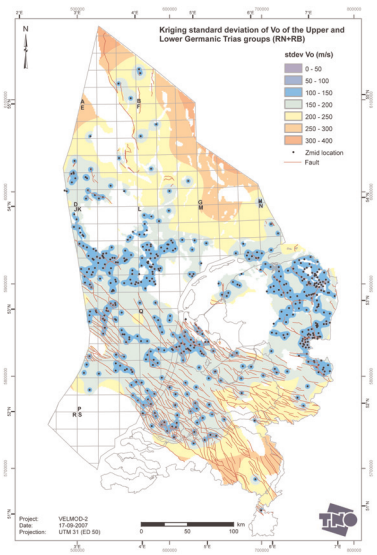

Figure 6 Kriging standard deviation of V_0 for the layer of the Upper and Lower Germanic Trias groups

Poster Naam 0000