Composition of natural gases in onshore and offshore in the Netherlands

TNO makes available the non-confidential part of its database on the compositions of natural gas and gross heating values of the hydrocarbon gases. New distribution maps were created from these compositional data and gross heating values. The data were analysed and interpreted to provide a process-based understanding of the distribution of the different hydrocarbon and non-hydrocarbon gas components. The maps and explanations will be made publicly accessible.

The database

The in-house database contains information compiled over the years from different sources, such as lab reports of analyses of gas samples from in-house, commercial and service company laboratories, and information on gas composition derived from published maps, reports and publications. The database is updated continuously with new information. At present the database contains the analyses of approximately 1400 gas samples from the Netherlands. It provides information on the compositions of natural gas and the calculated gross heating values of the hydrocarbon gases, while more than 170 analyses also include information on the isotopic compositions of hydrocarbons, nitrogen and carbon dioxide. The non-confidential part of this database is available on the internet (www.nlog.nl). This publicly accessible database contains, per data point, the well name, depth, stratigraphic unit, Mol% of the main hydrocarbon components (C1, C2, C3, i-C4, n-C4, i-C5, n-C6, $C7^+$) and non-hydrocarbons (CO_2, N_2, H_2S), and the calculated gross heating values of the hydrocarbon gases.

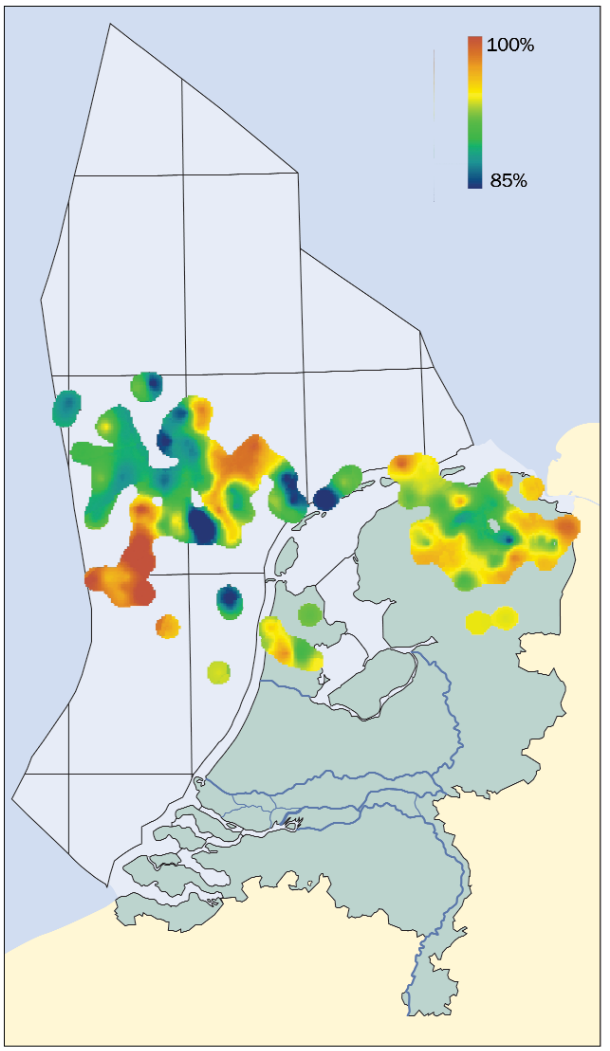

Figure 1.
The distribution of the ratio, $C1/(C1+C2+\ldots+C7^+)$ (in Mol%), for natural gas accumulations in the Upper Rotliegend Group.

The maps

New distribution maps were created from the compositional data and gross heating values of the non-confidential database. The different maps display – for the main reservoir units – the distribution of a single hydrocarbon component, the ratio of hydrocarbon components and the distribution of CO_2, N_2 and H_2S. Figure 1 shows an example of a distribution map for the molecular ratio $C1/(C1 + C2 + \ldots + C7^+)$ (in Mol%) observed in the Upper Rotliegend Group. The following approach was used for constructing the map (Figures 1 and 2):

- Data selection based on: availability of surface coordinate data (no compensation for deviation); known reservoir unit; sum of all gas components is > 95 Mol%;
- For each well location, one value for $C1/(C1 + C2 + \ldots + C7^+)$ was used. If more than one analysis was available for the selected reservoir, the average value for each component was used in the calculations;
- Interpolation of data was carried out with the Isatis program based on a variogram with a spherical model (nugget: 0.6, range: 15 km, total sill: 5.0) and a search radius of 300 km;
- Only that part of the map is visualised where the kriging standard deviation is < 2%.

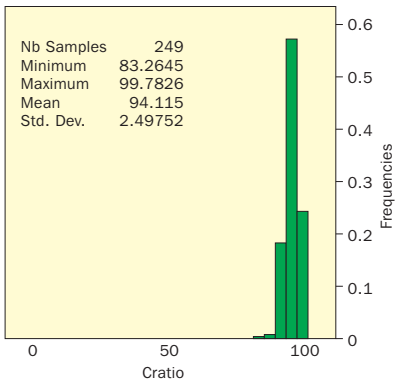

Figure 2. Histogram of the ratio, $C1/(C1+C2+\ldots+C7^+)$ (in Mol%), for natural gas accumulations in the Upper Rotliegend Group.

Analysis and interpretation

We compiled a comprehensive overview of the main factors and processes of influence on the present-day composition of hydrocarbons and non-hydrocarbons in natural gas accumulations of the onshore and offshore Netherlands. This overview includes the results of a preliminary analysis and interpretation of the compositional data and the available isotopic compositions of hydrocarbons, nitrogen and carbon dioxide. It will be made available at the website: www.nlog.nl.

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