Bernard Carpentier[1] (1) Institut Français du Pétrole, Rueil-Malmaison, France

# New Concepts for Biodegradation Evaluation in Oil fields, a Combined Geological and Numerical Approach

Predicting low API8 oil due to biodegradation is critical issue for deep-water exploration. We have developed a preliminary biodegradation 1D model that takes in account most of the parameters which probably control biodegradation (number of bacteria, hydrocarbon type preference, temperature, porosity, water saturation, hydrocarbon and water fluxes).

In this conceptual model, biodegradation is simulated in the oil/water transition zone where the bacterial population is assumed to be at equilibrium with the medium.

In order to evaluate the vertical distribution of the oil composition in an oil field, this numerical biodegradation model is integrated into two theoretical geological scenarios:

1) Post filling biodegradation: the trap is filled by the oil when the reservoir temperature is above 70/808C and the reservoir is then uplifted to temperatures compatible to biodegradation. The oil/water transition zone is located at the bottom of a non-biodegraded oil column. This transition zone slowly migrates upward due to the hydrocarbon consumption and associated capillary re-equilibrium. Only the basal part of the field is heavily biodegraded leading to a "tar mat" like formation.

2) In filling biodegradation: the trap is filled when the reservoir temperature is below 70/808C. The oil/water transition zone slowly migrates downward due to the progressive filling of the structure. The level of biodegradation of the oil is largely controlled by this displacement rate which is related to the structural shape of the reservoir.

The validity of this model is currently under evaluation and a statistical approach will be launched to better constrain the model parameters.