Creative Thinking Led to 40 Years of Success in Mahakam, Indonesia*

Bernard Duval[1]

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[1]IFP School, Rueil-Malmaison, France (bernard.duval@ifp.fr)

Key Points

- First Period of Exploration and Development
  - Hunting for the Structural Play ...and more than that
- Second Period
  - Rethinking the Petroleum System
  - Finding a New Giant
- Third Period
  - Follow-up, still in progress...
    - Establishing a New Field Model
    - Improved Seismic Resolution
    - Hydrodynamics at Work in the Mahakam---and Elsewhere

Main Drivers of Success

- The "Hard Skills"
  - Regional perspective, re-questioning of the petroleum system & field model
  - Out-of-the-box thinking with relativistic view of past “dry” wells
  - Creative “what if” approach
  - Well focused application of technological advances
- The “Soft Skills”
  - Tenacity & power of conviction
  - Fundamental optimistic attitude
  - Strong team spirit
  - Proactive management that really wants to drill exploration wells

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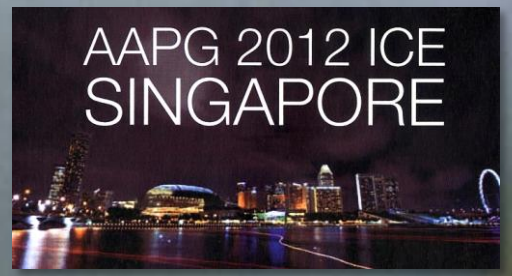
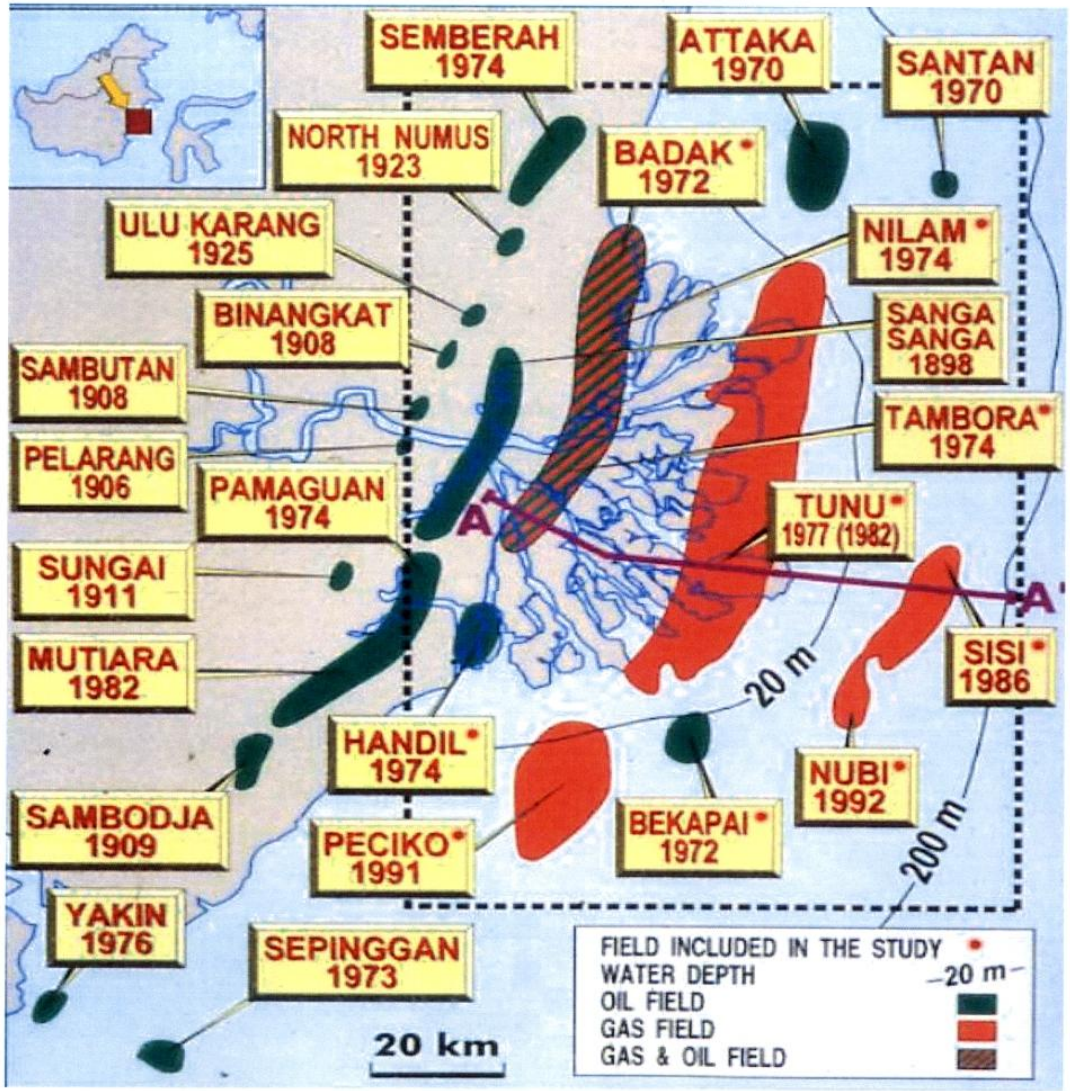


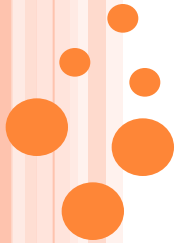
A Hundred-Year-Old Petroleum Exploration History…



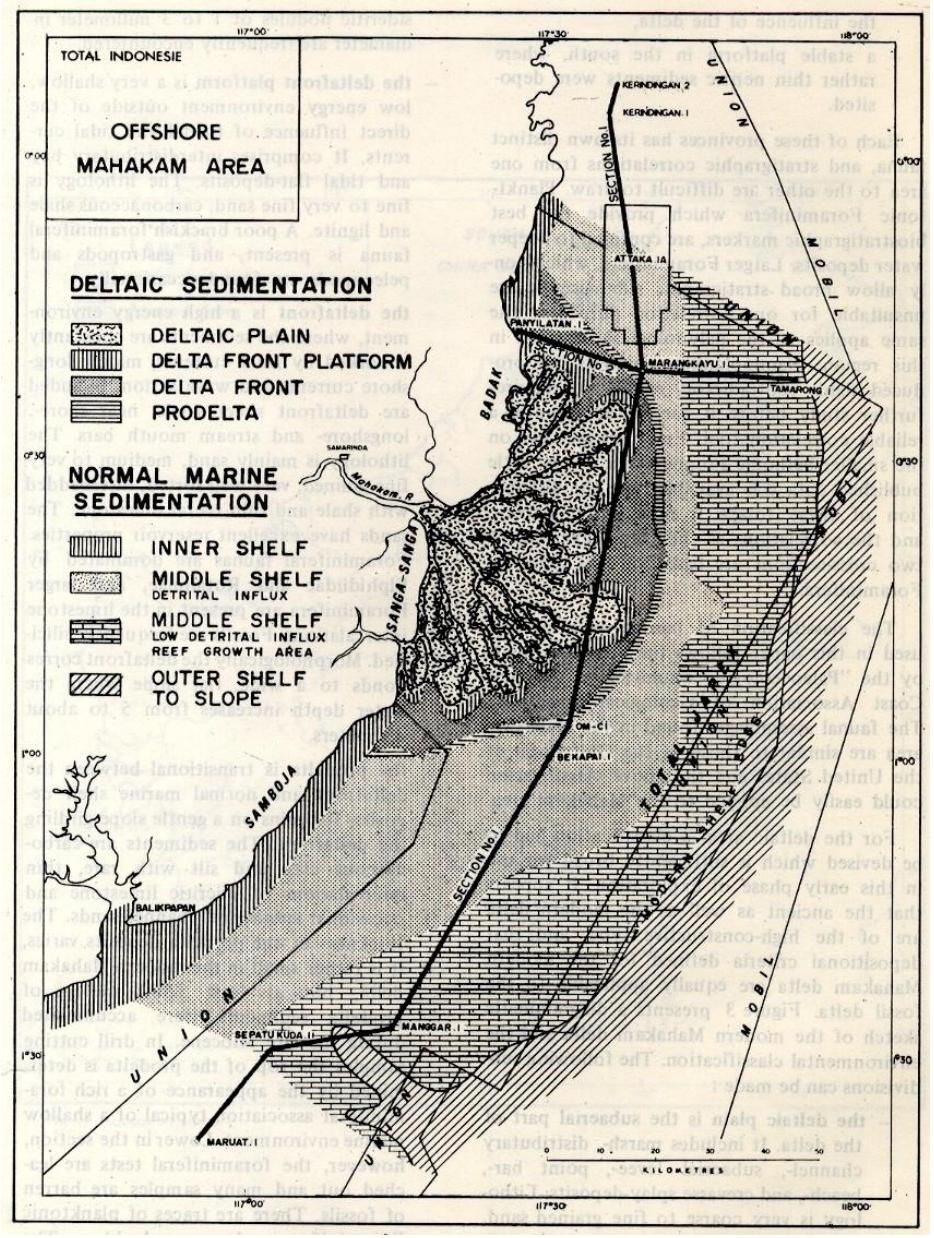
First Period

- Hunting for the Structural Play

  ...and more than that

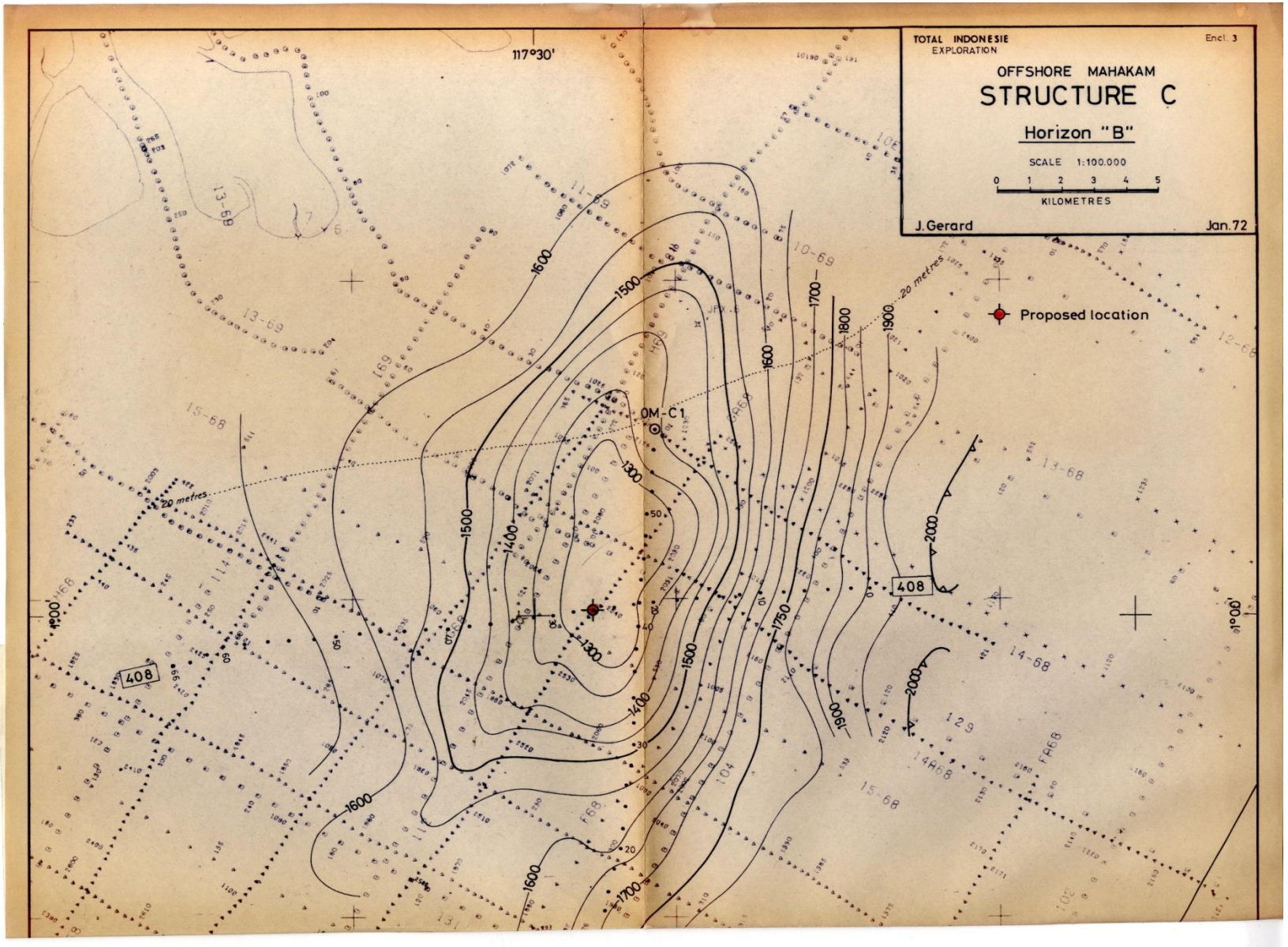


First Published Facies Map of the Mahakam Delta PSC



from J.Gérard, 1972

Original Structural Map of the Bekapai Structure



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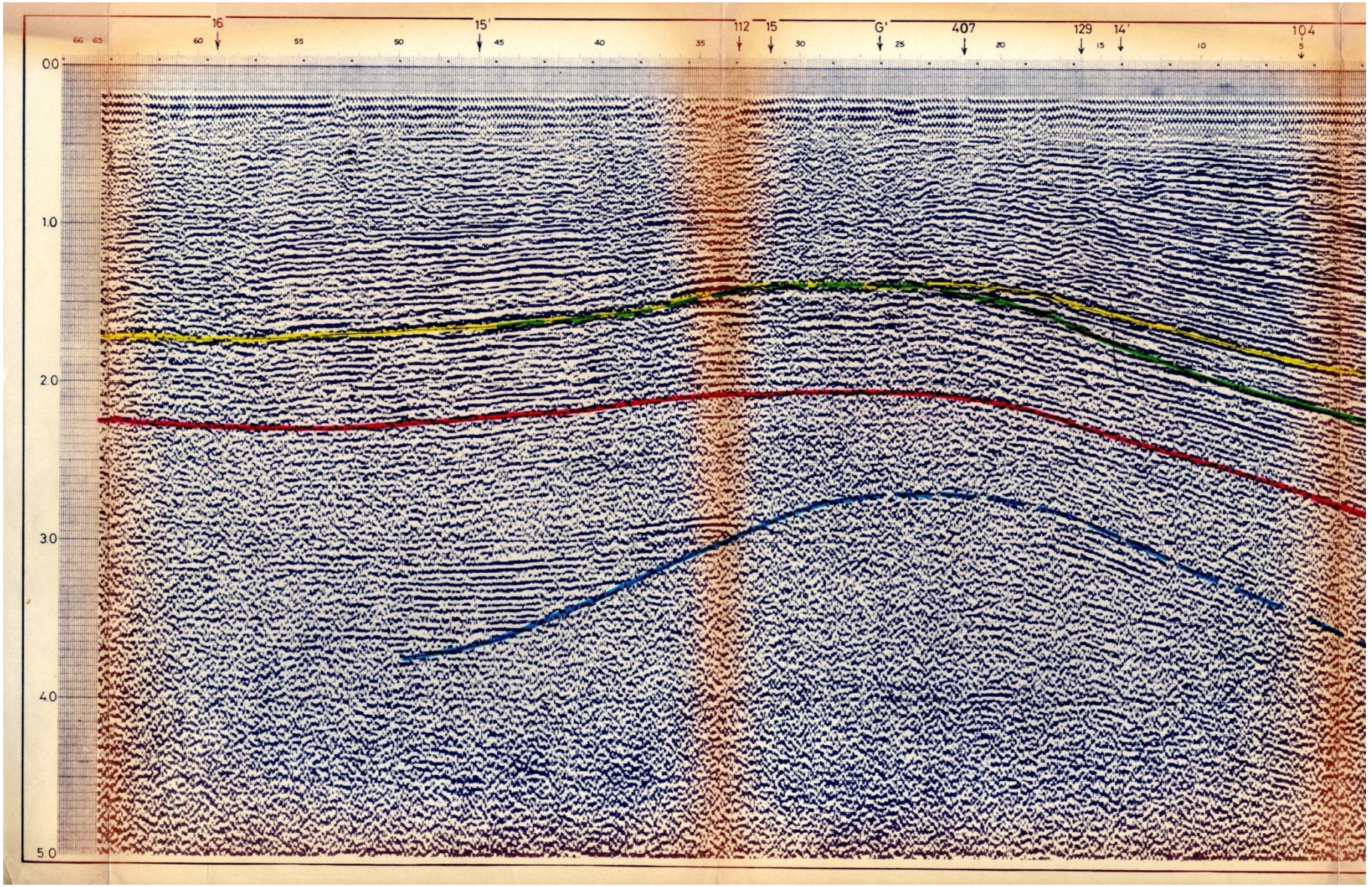
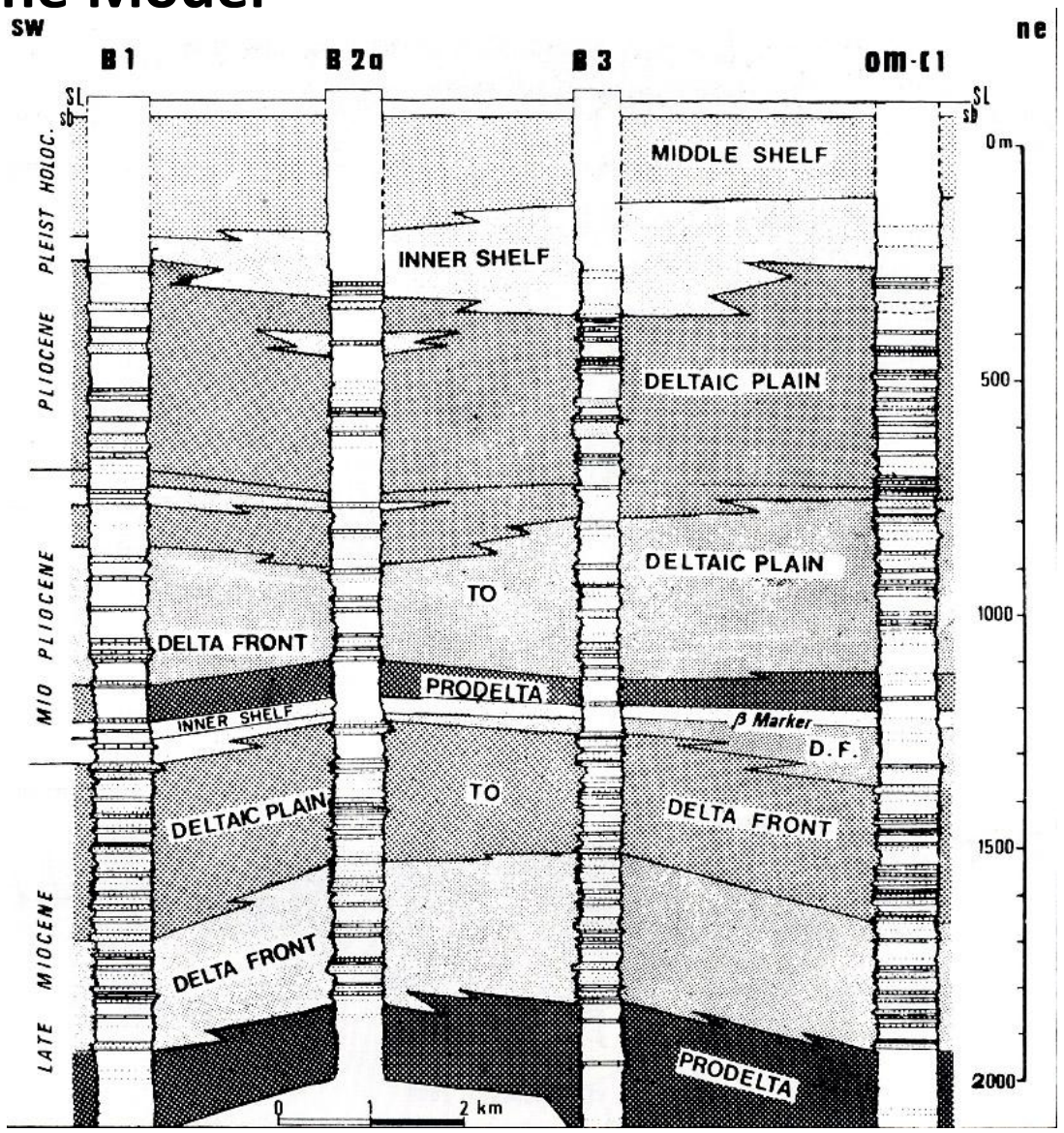
Seismic Line 408

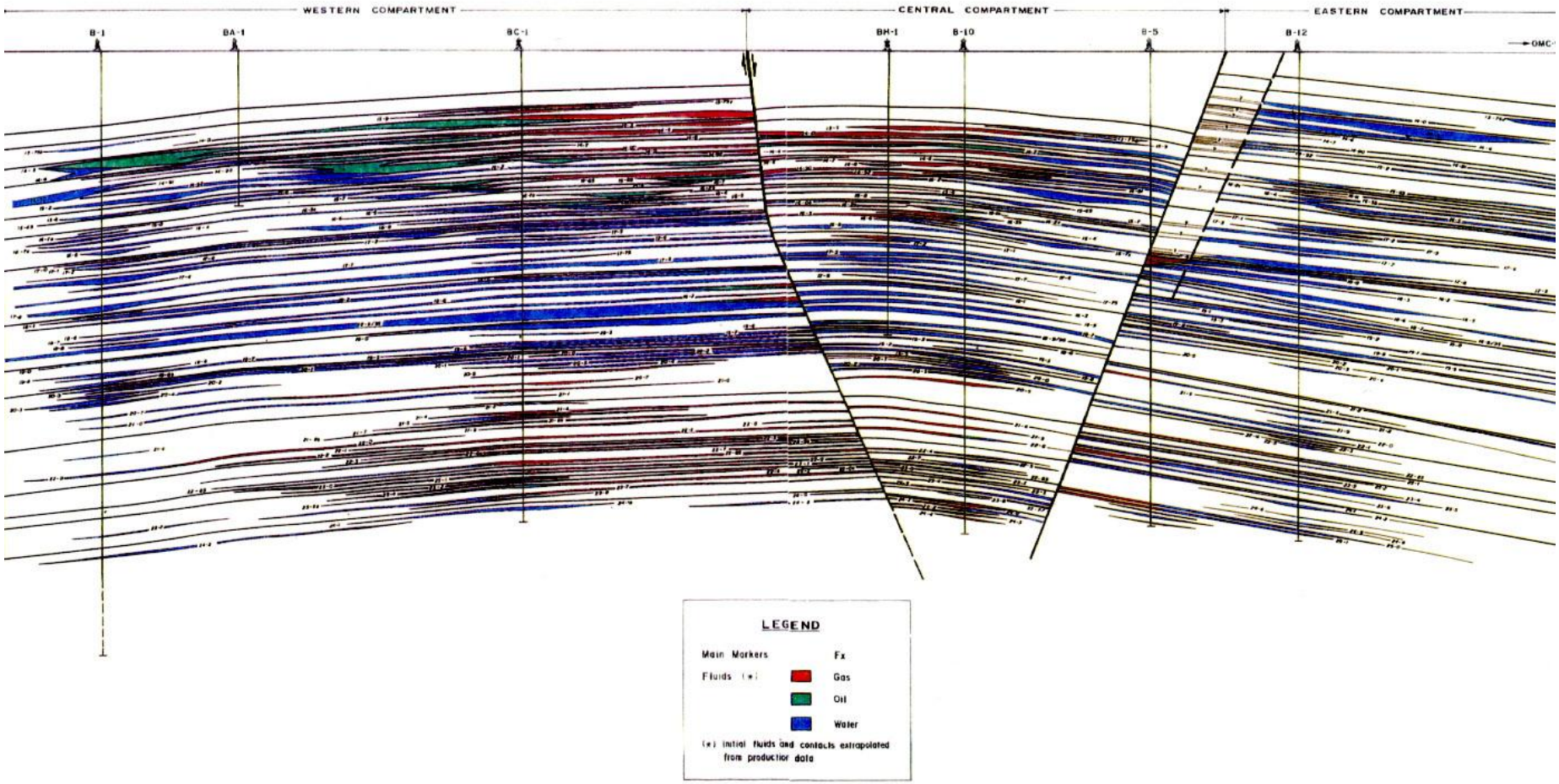


Column Illustration of Depositional Environments, Confirming the Model

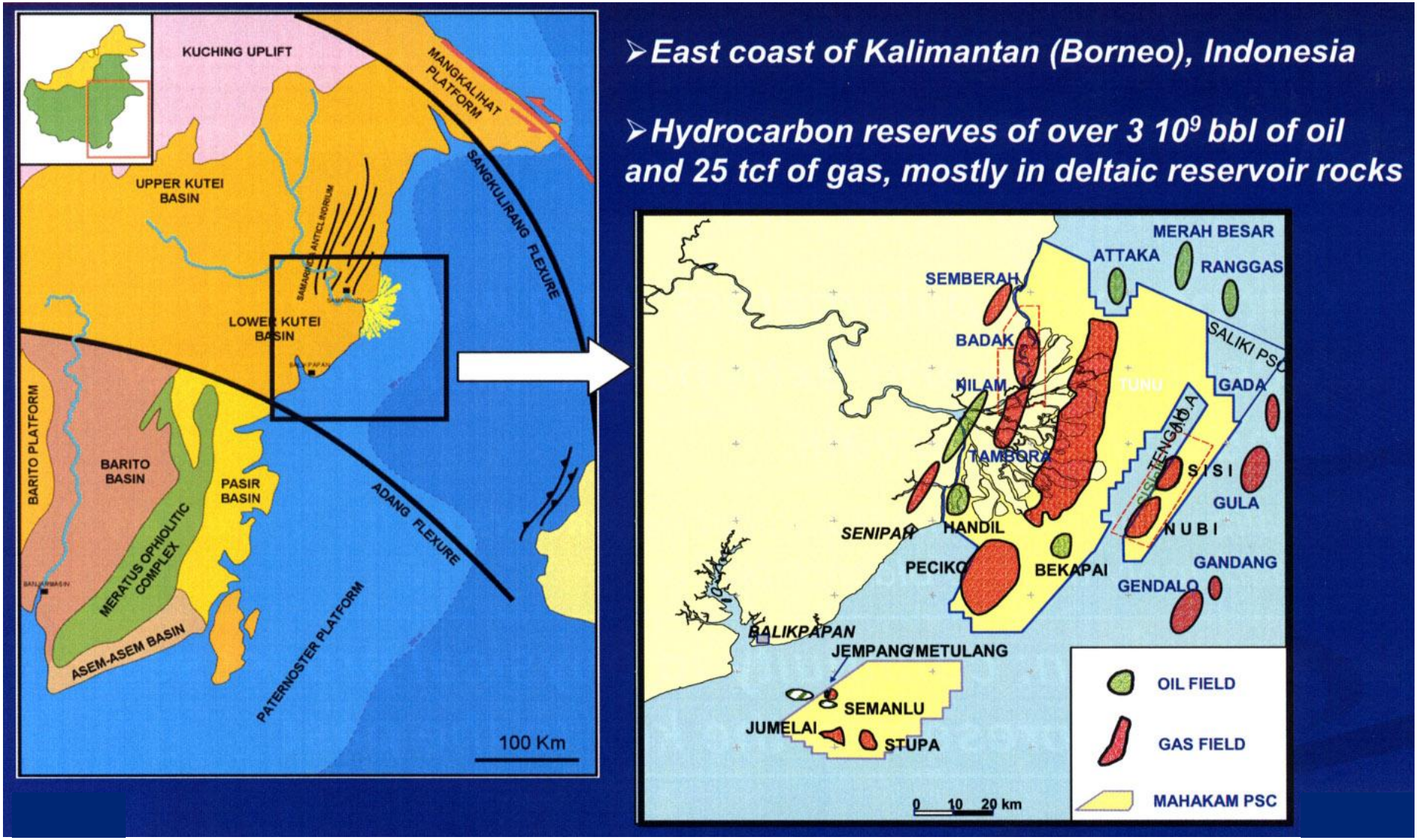


from M.de Matharel et al, 1980

Cross-section of Bekapai Field



The Mahakam Delta: a Province of Giants



Seismic Operation in the « Onshore » Area

Drilling for Seismic in the Delta

Preparing for Drilling in the Delta

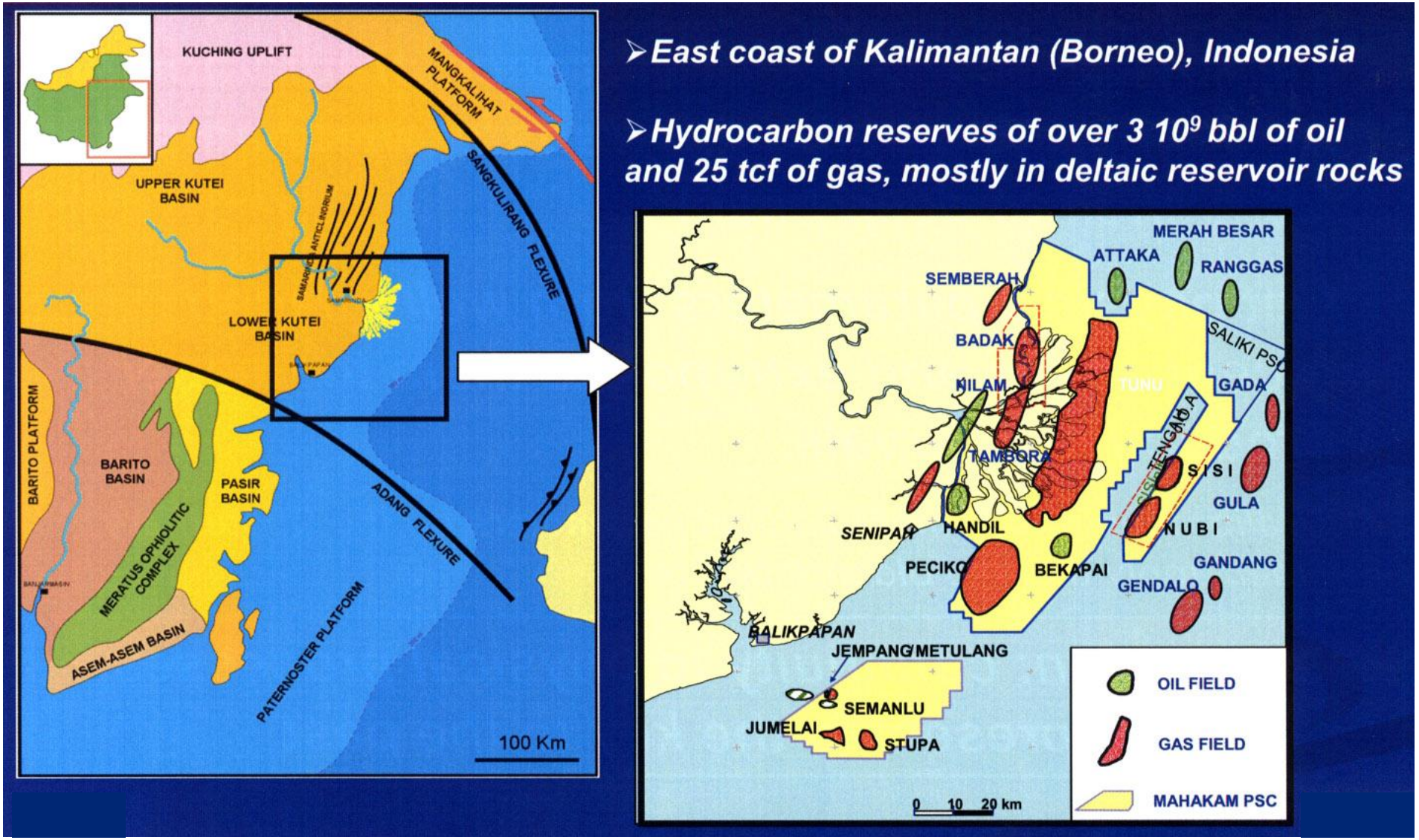
Transition Zone Seismic Activities
Bridging & Jetty Construction

Courtesy Total

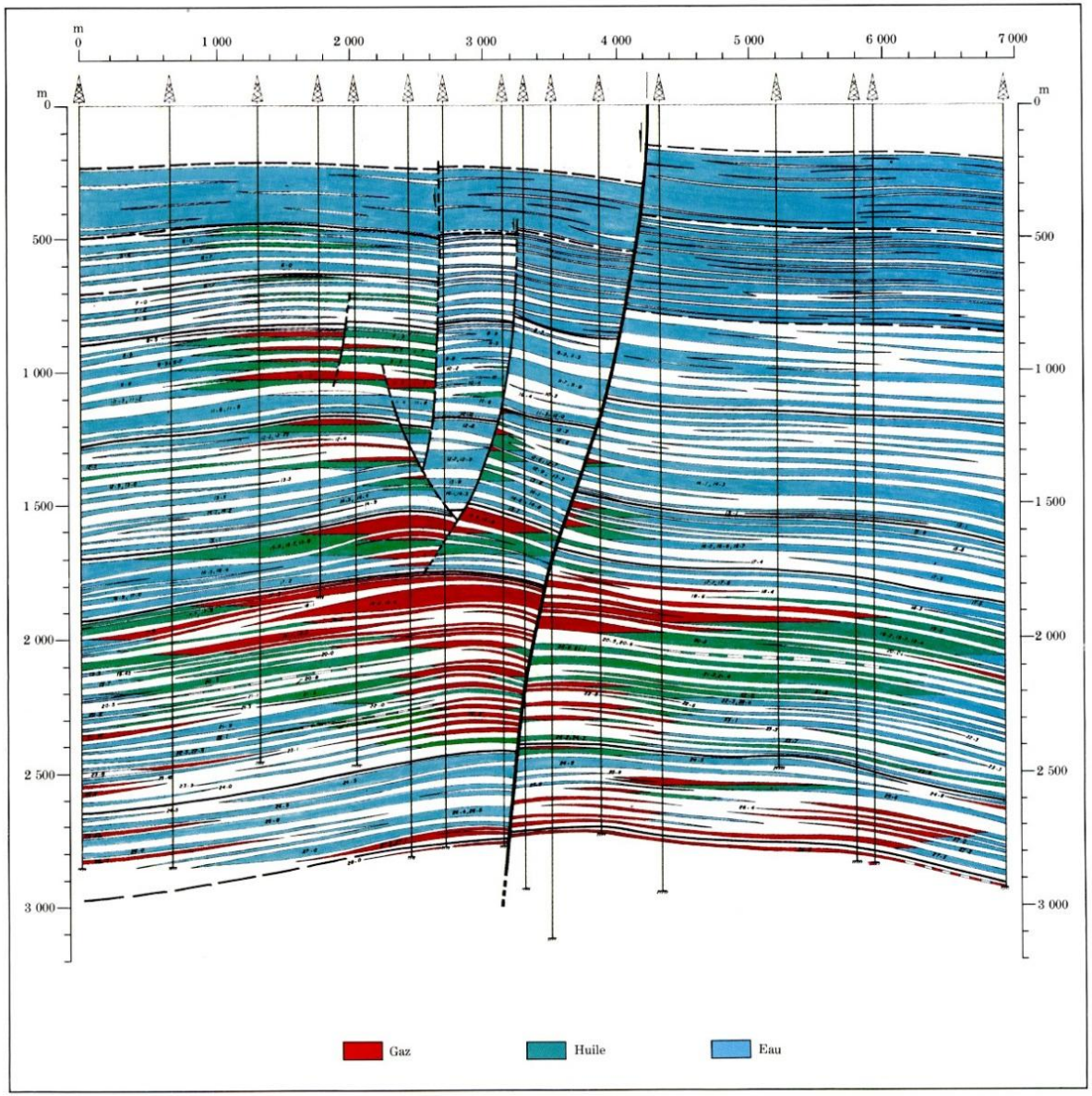
The Mahakam Marina Bay Sands…

Field visit by a Human Resources Director…

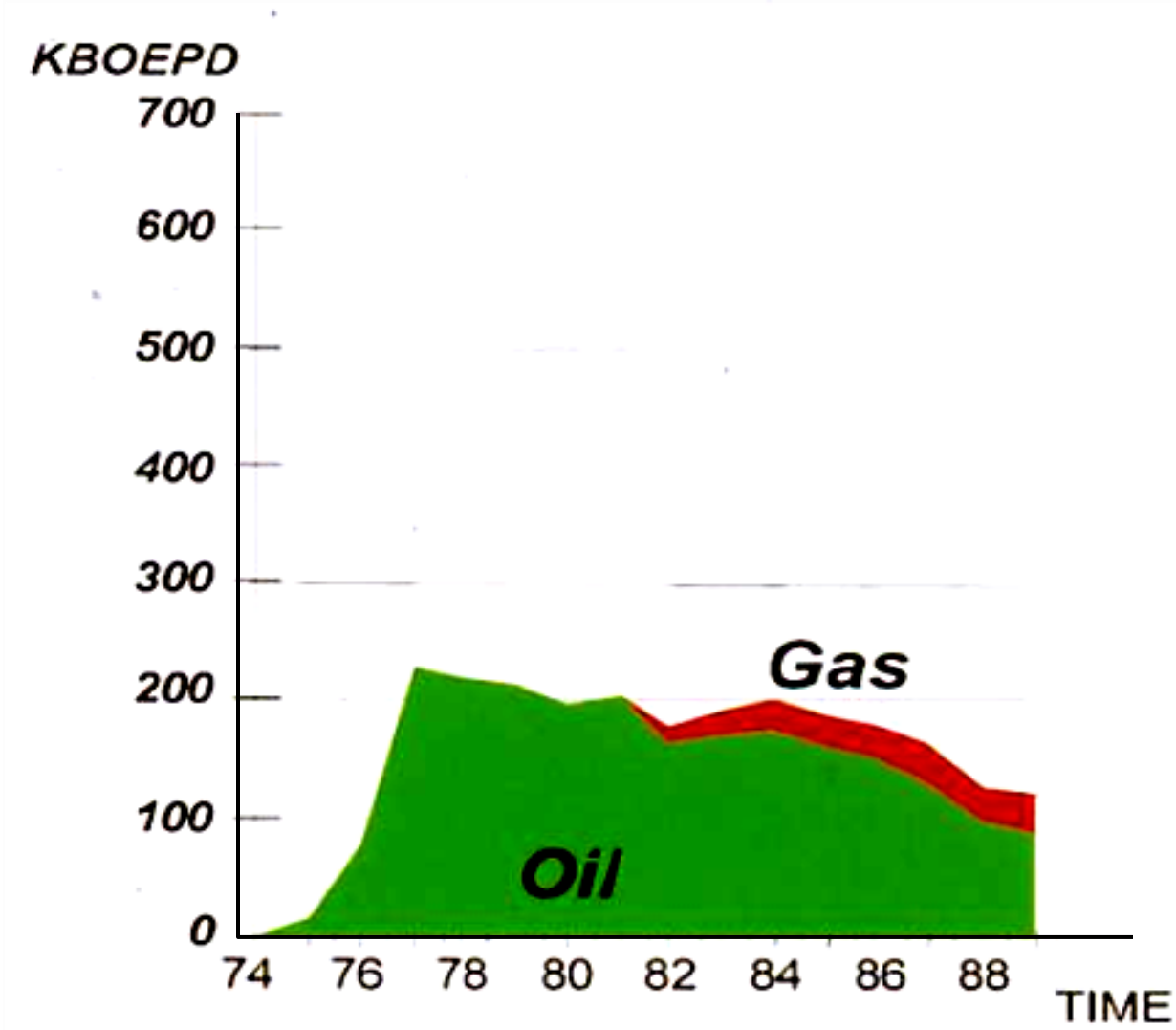
The Mahakam Delta: a Province of Giants



Cross-Section of Handil Field



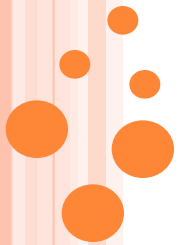
Offshore Production Trend in the Mid-Eighties



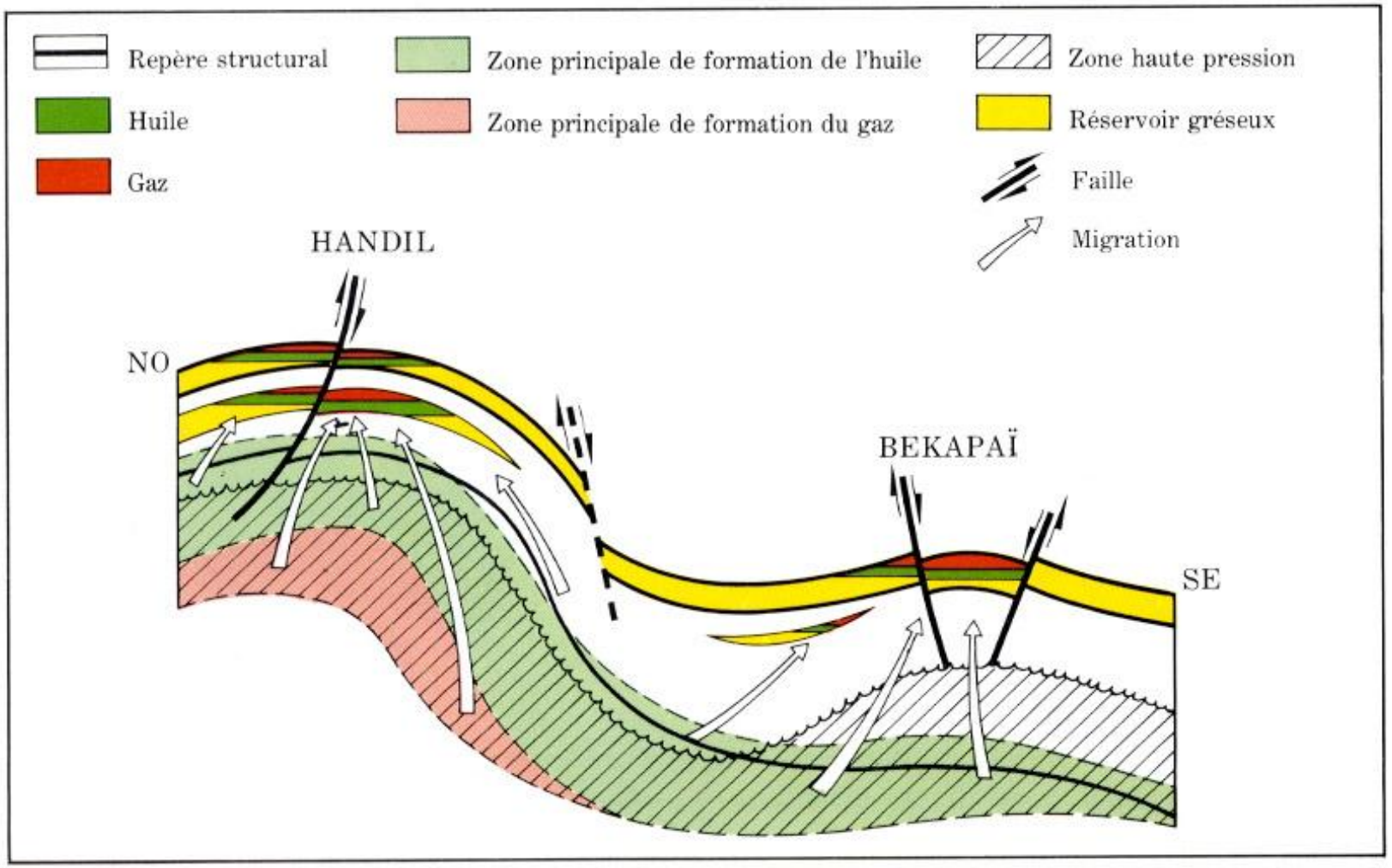
* Total's Operating Share

Second Period

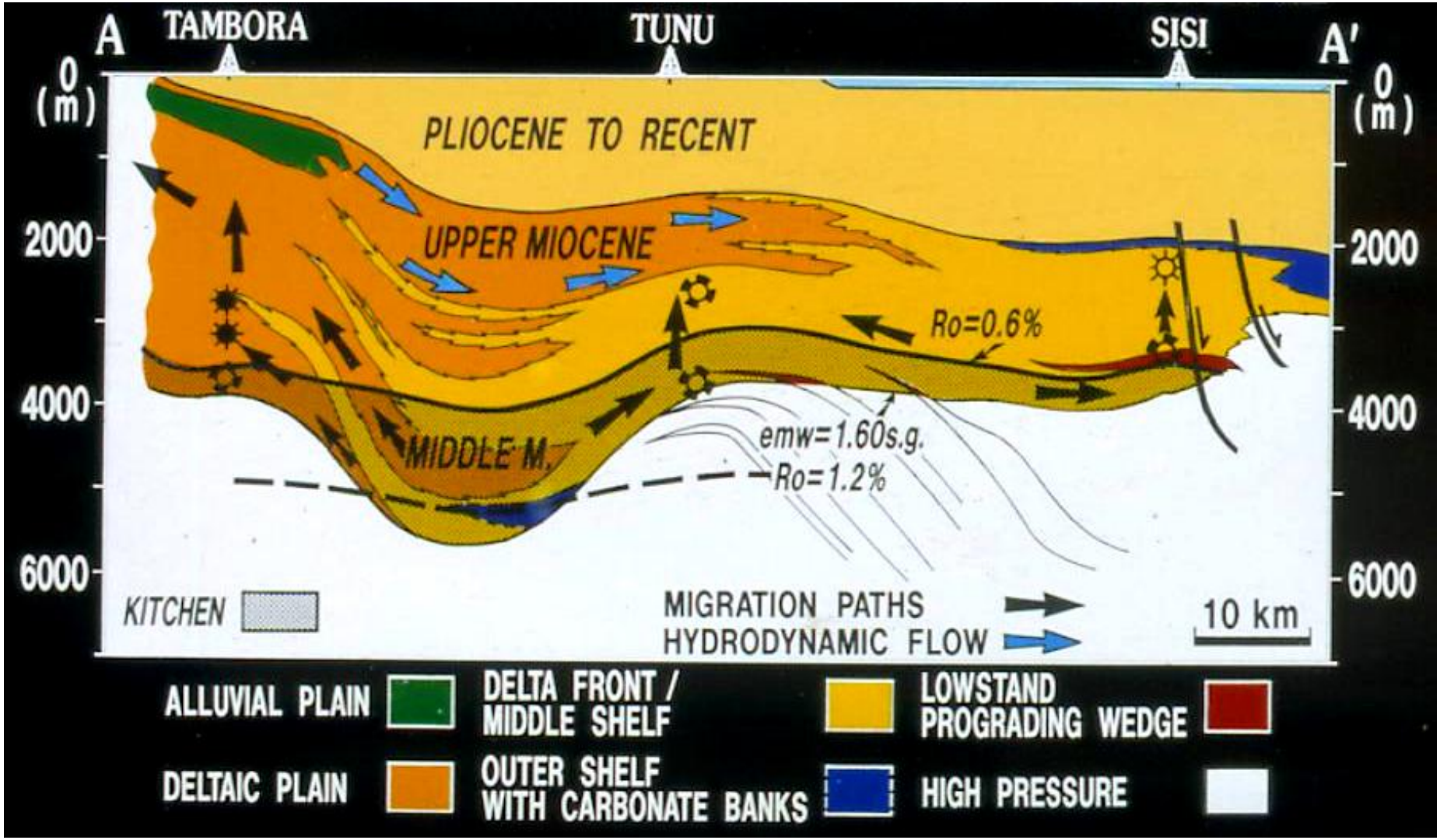
- Rethinking the Petroleum System
- Finding a New Giant



The First Model of Petroleum System

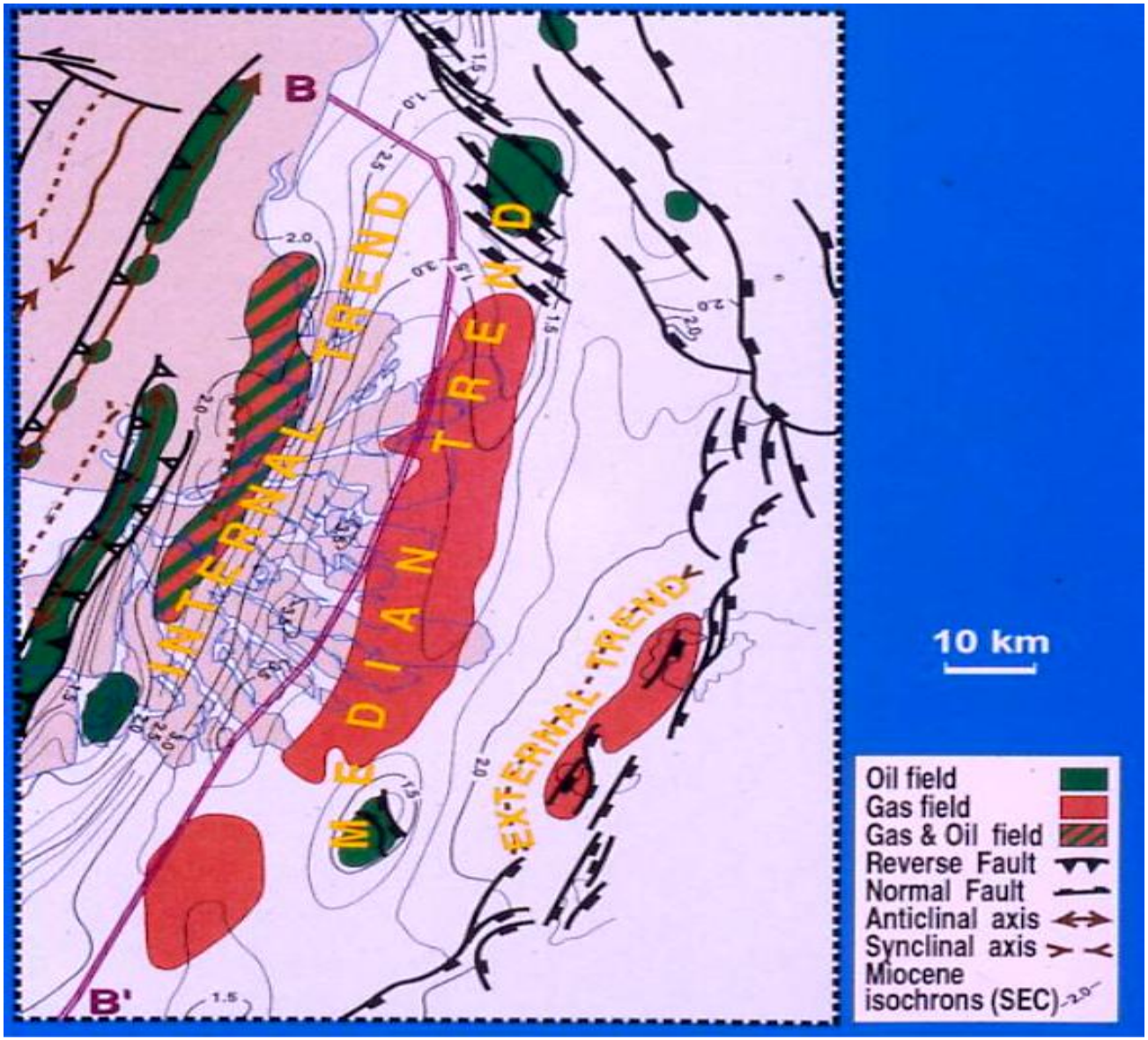


The Mahakam delta oil machine

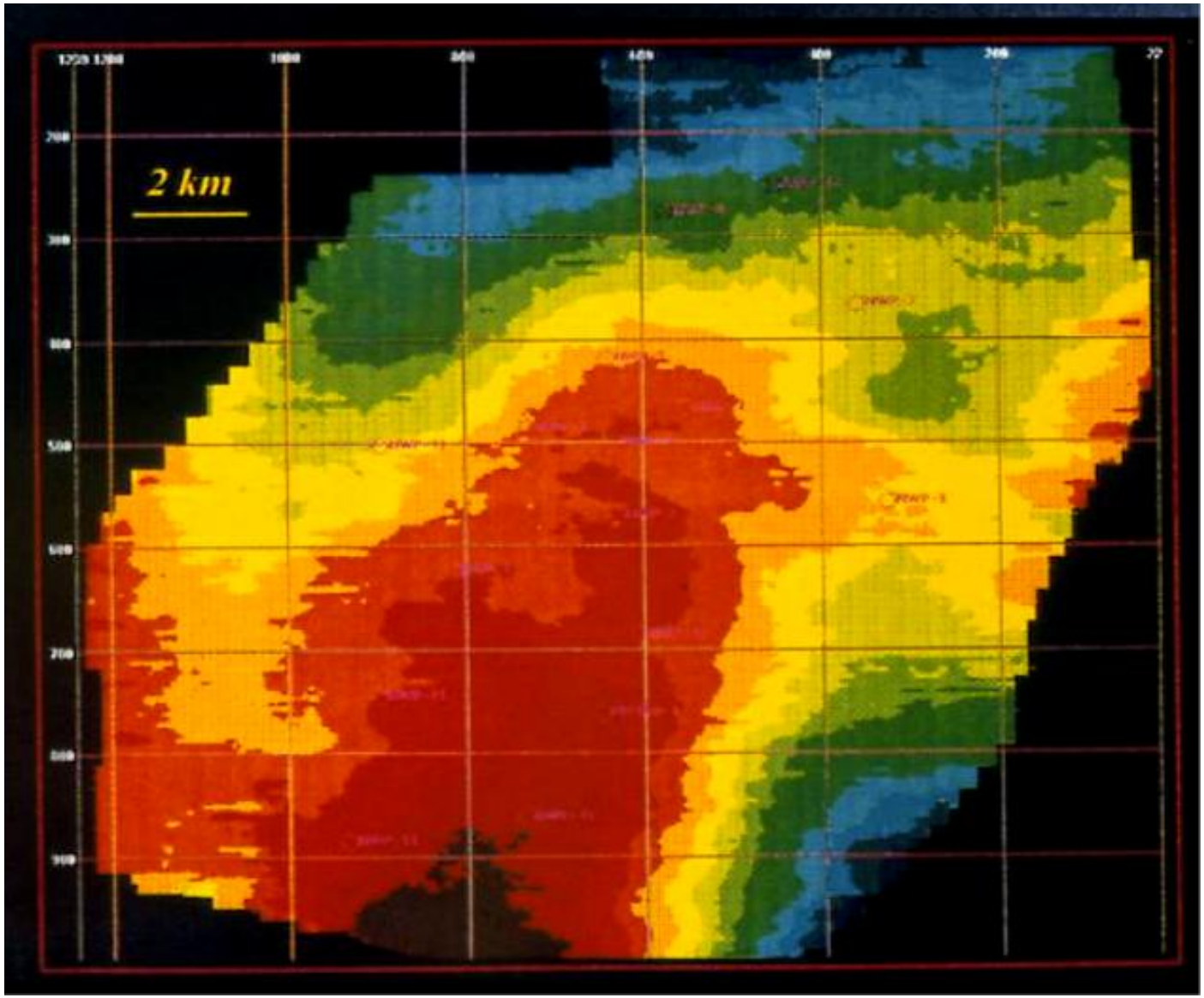


from B.C. Duval et al., 1992

Structural framework of the Mahakam delta

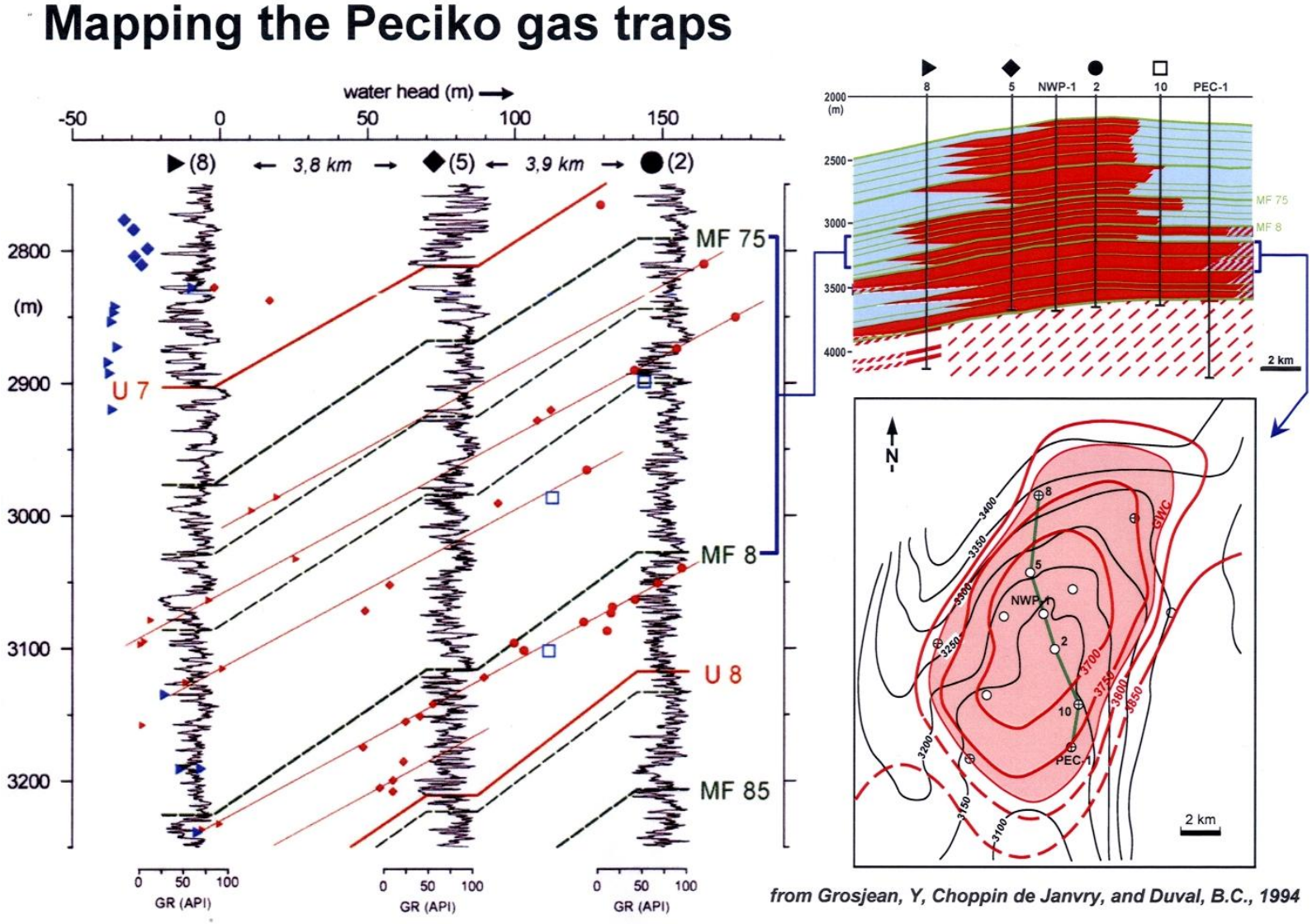


PECIKO : Time Map at MF8



from Y.Grosjean

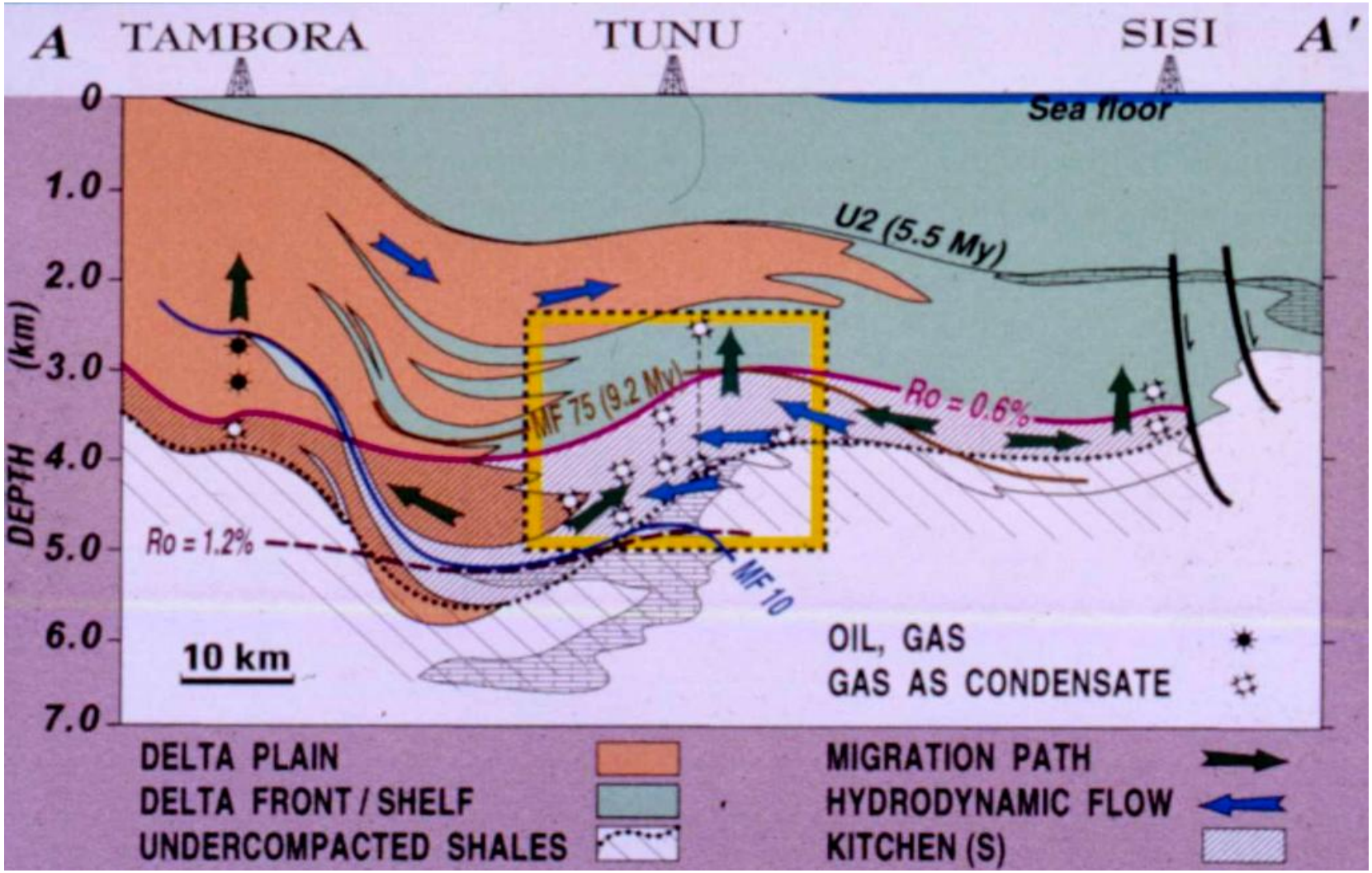
Gas Filling and Hydrodynamics



Third Period: Follow-up, still in progress...

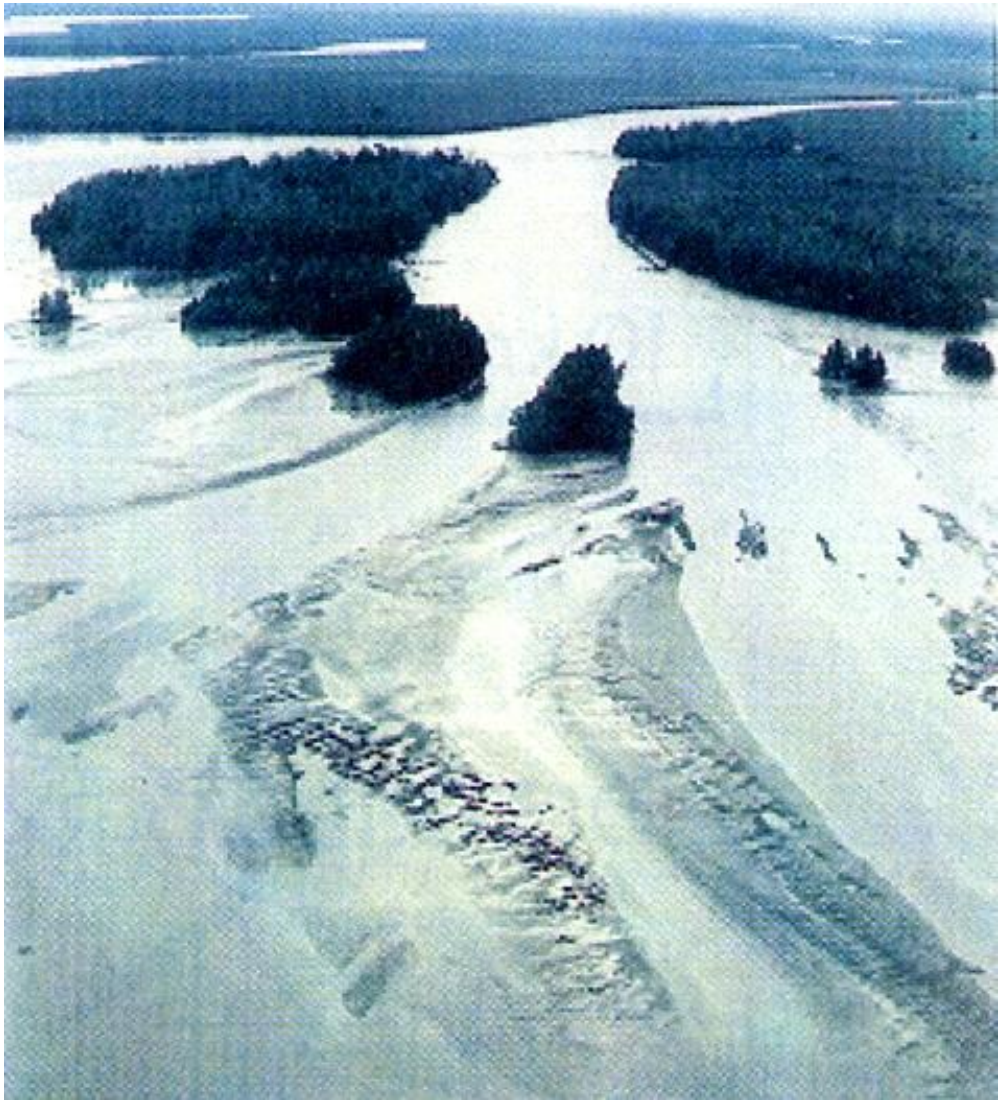
- Establishing a New Field Model
- Improved Seismic Resolution
- Hydrodynamics at Work in the Mahakam…and *Elsewhere*

The Mahakam Petroleum System - The Renewed Model

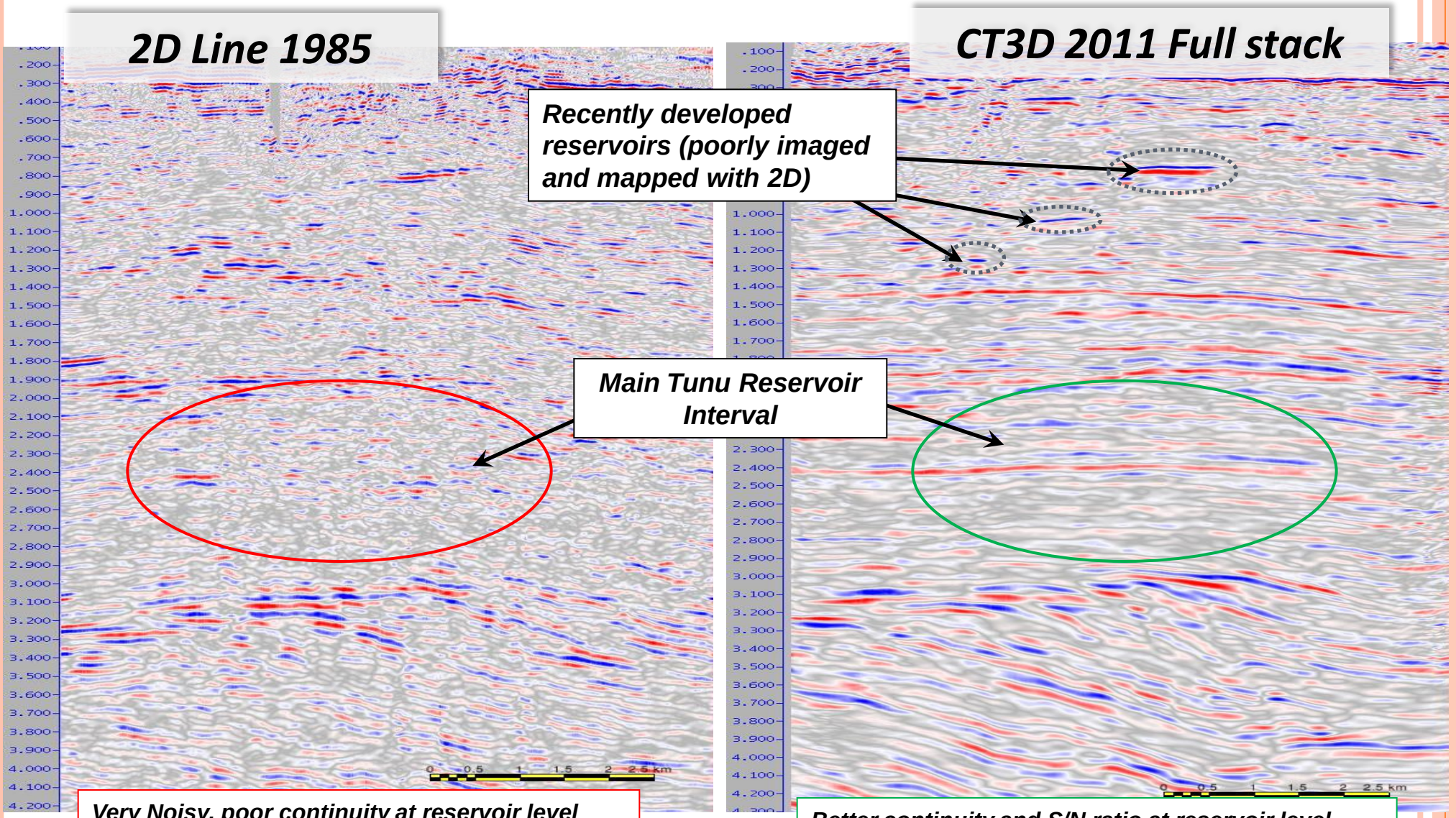


from B.C. Duval et al., WPC, 1998

Mouth Bar of the Modern Delta

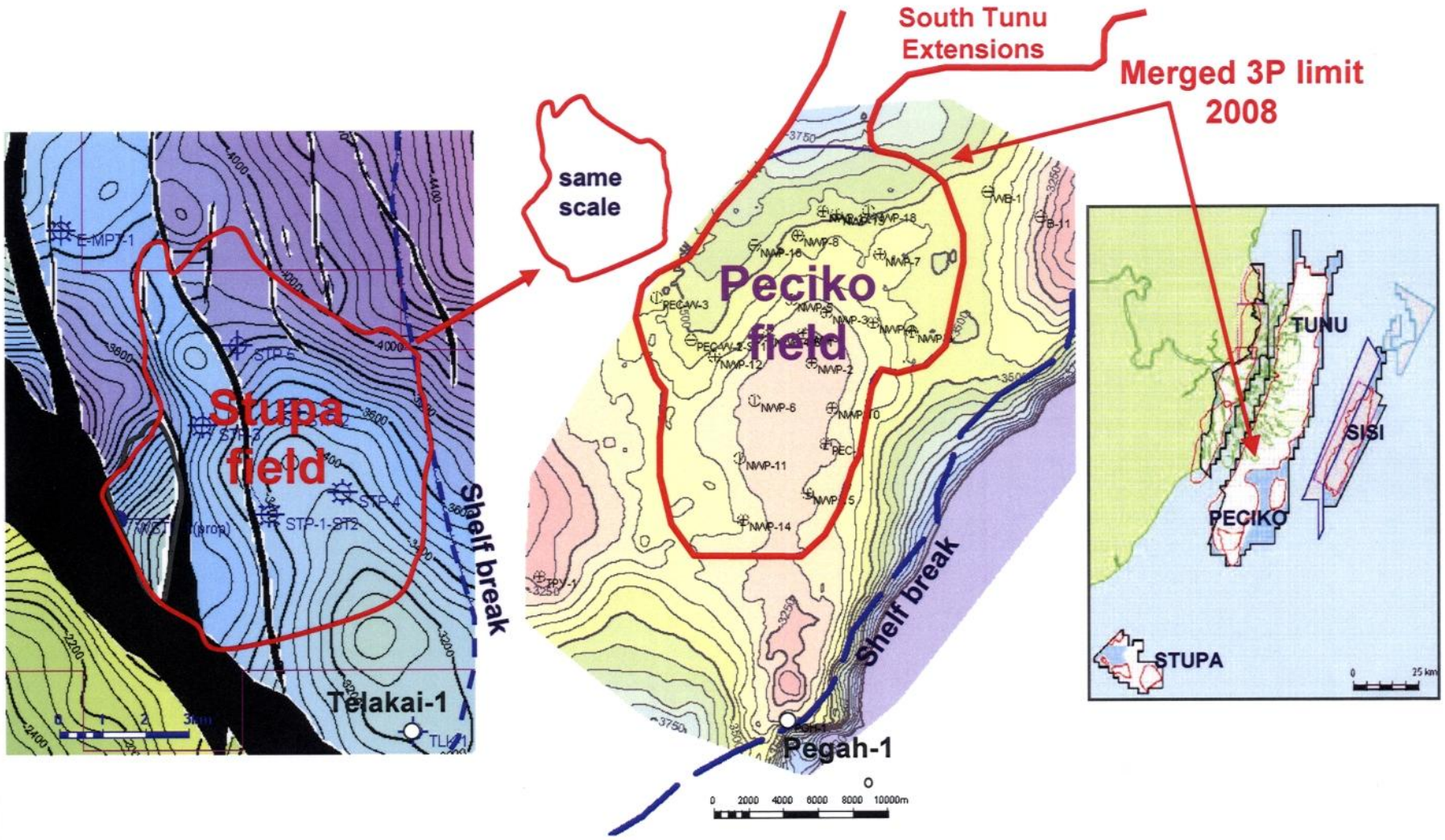


Seismic lines: Comparison on Tunu Field
2D line 1985 vs 3D 2011



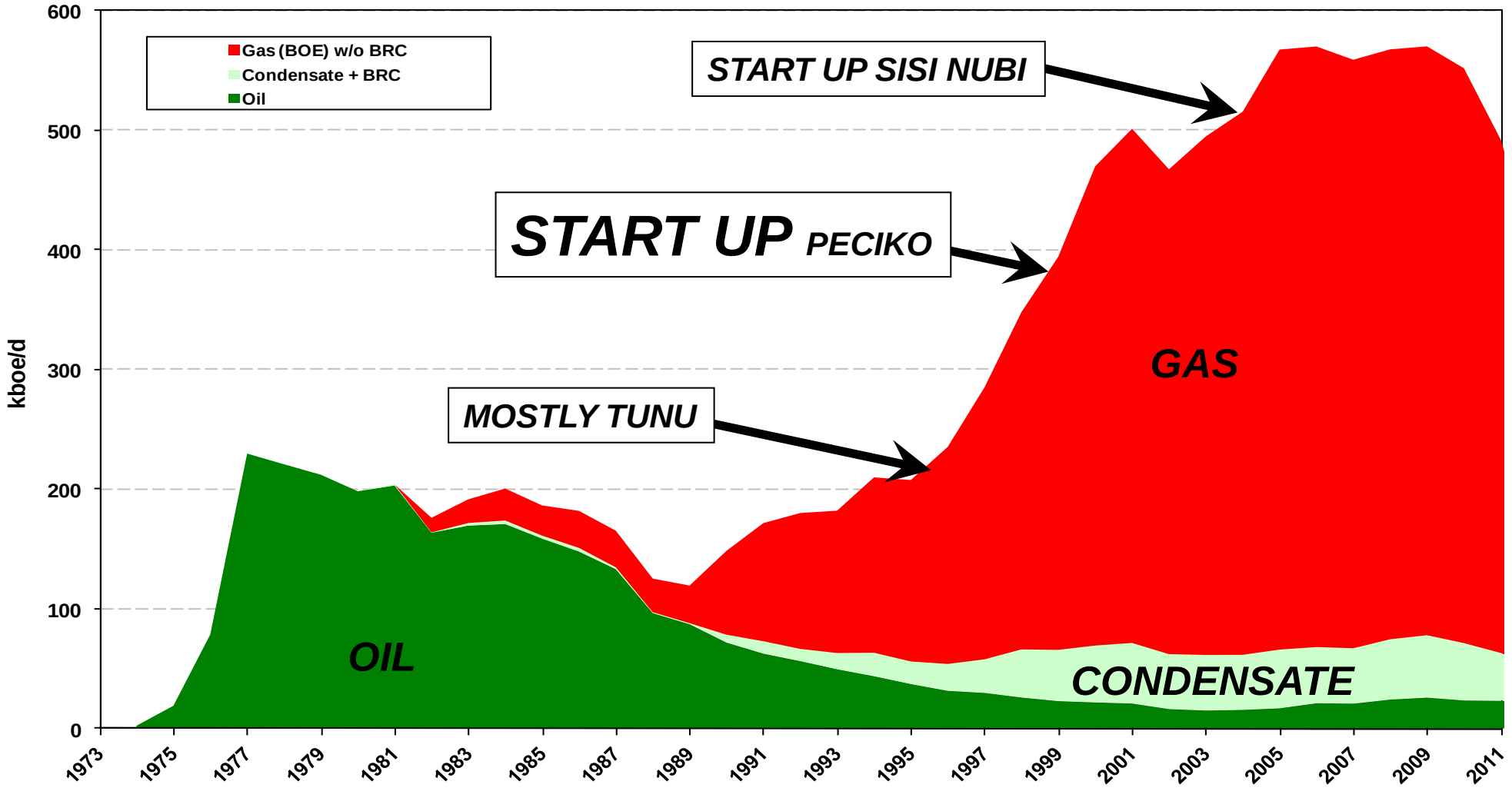
Courtesy of Total E&P Indonésie

Extending the Model to South Mahakam



from Y.Grosjean et al, 2009

Total Operated Production in Mahakam PSC (BOED)



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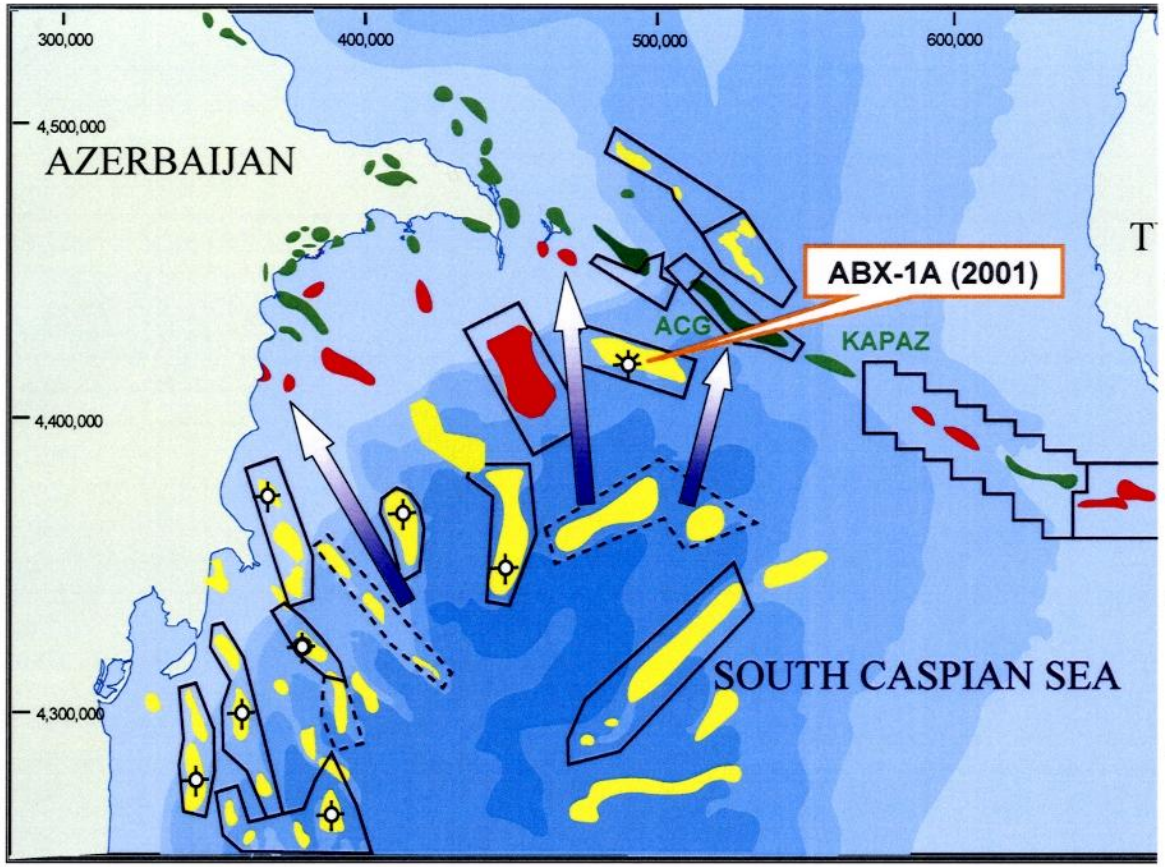
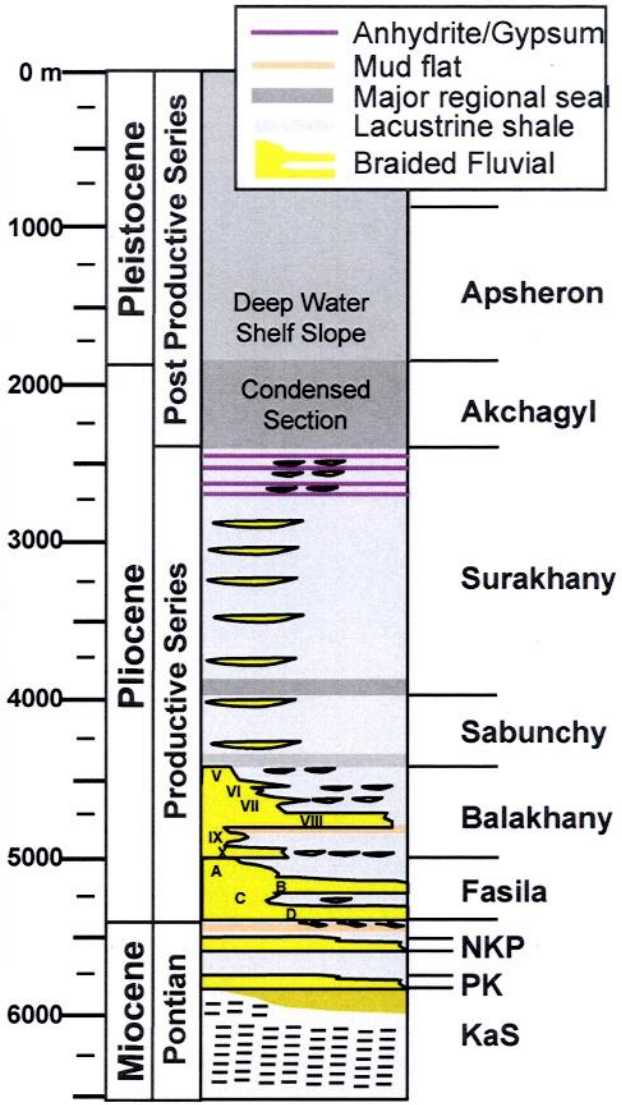
Elsewhere--The Absheron Prospect in the South Caspian



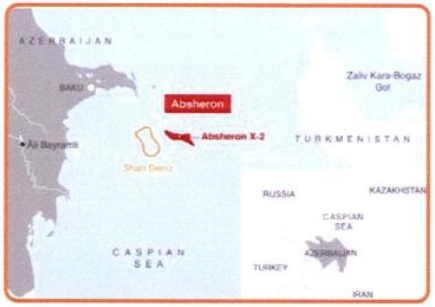


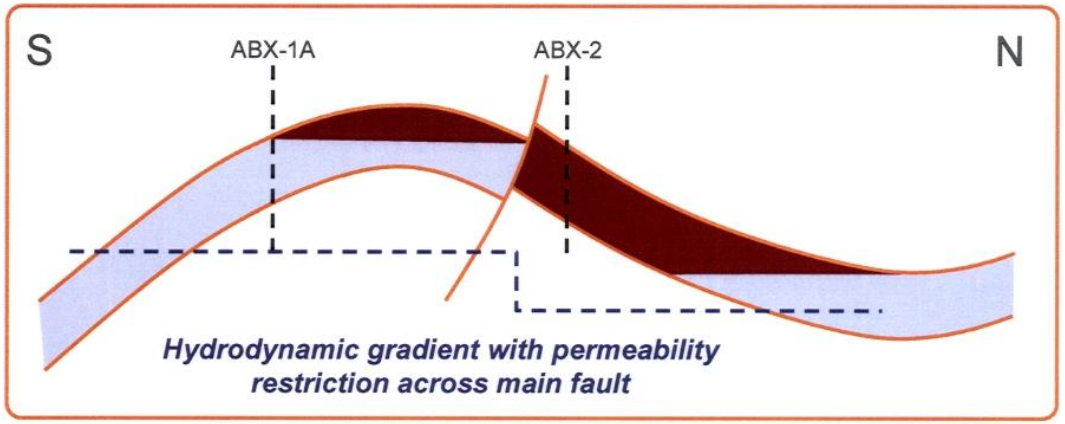
from Y.Grosjean et al, 2009

Absheron: from Concept to Discovery

Azerbaijan : Absheron X-2

- Total (op.) : 40%
- Large delta
- Deep reservoir, new pressure concept
- Elephant-size gas and condensate discovery
- 500 feet net pay
- Giant structural closure : approx. 270 km²
- Next step : deeper drilling, test, side track and delineation





Successful example of high risk, high reward exploration

Courtesy Total Exploration-Production

Main Drivers of Success: the "Hard Skills"

- Regional perspective, re-questioning of the Petroleum system & field model
- Out-of-the-box thinking with relativistic view of past “dry” wells
- Creative “what if” approach
- Well focused application of technological advances

And the “Soft Skills”!

- Tenacity & power of conviction
- Fundamental optimistic attitude
- Strong team spirit
- Proactive management that really wants to drill exploration wells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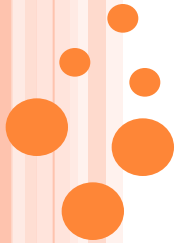
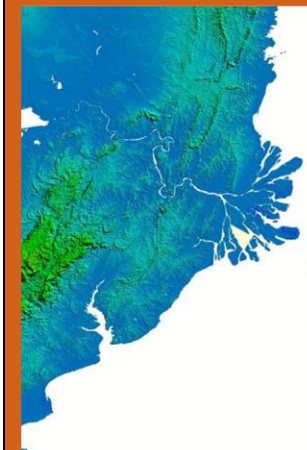
Prague, March 2012

« Exploration is Hard Work, Smart Work and … an ART »

John Masters





Acknowledgments

We would like to thank BPMigas, Migas, Inpex, and Total E&P Indonésie for allowing us to publish this paper

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Presenter's notes: I would like to thanks BPMigas and INPEX for allowing us to publish this paper, and, of course, all the people in Total and Elnusa and CGG Veritas, who were involved in this project.