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Danube Basin
Assessment Unit 40480301

Danube Basin Assessment Unit 40480301

Pannonian Basin Geologic Province 4048

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USGS PROVINCE: Pannonian Basin (4048) **GEOLOGIST:** G.L. Dolton

TOTAL PETROLEUM SYSTEM: Danube Neogene (404803)

ASSESSMENT UNIT: Danube Basin (40480301)

DESCRIPTION: This assessment unit consists of traps and accumulations in the Cenozoic basin fill of the Danube basin and in underlying Mesozoic basement nappes. Reservoirs are charged by Tertiary and Mesozoic organic-rich source rocks. Significant vertical migration characterizes this unit. Structural, stratigraphic and combination traps include growth faults, compaction features over basement highs and pinchouts in fluvial, shallow water, and turbidite sandstones and conglomerates, unconformity traps–particularly at the regional unconformity between synrift and postrift rocks, and in paleotopographic highs beneath the Tertiary fill, traps in basement nappes, and traps associated with strike-slip zones.

SOURCE ROCKS: Neogene rocks, principally in the Miocene Sarmatian and Badenian sequences, are principal source rocks within Hungarian portion of the basin, but are of poor quality and largely gas prone, containing primarily Type II and Type III kerogen. In the Slovakian portion of the basin, the sources are Neogene sediments, particularly Lower Pannonian, Sarmatian, Middle Badenian, and lower Miocene, containing primarily Type III kerogen. Neogene source rocks are principally Pre-Pannonian marine rocks and Lower Pannonian lacustrine rocks.

The Upper Triassic Kössen marl is a principal source rock of the oils in the nearby Zala basin but has not been identified in the Danube basin. Triassic Veszprém Marl has been tentatively identified, but is of low organic content. Both are exposed in the nearby Transdanubia Central Range as rich source rocks.

MATURATION: Maturation of both Tertiary and Mesozoic source rocks began in late Miocene in the Hungarian portion of the basin. In Slovakia, the existing alteration of organic matter in the basement has been interpreted to have been reached before the Tertiary, possibly during the Middle and Upper Cretaceous, followed by Tertiary burial and heating. Mesozoic source rocks, if present, are so deeply buried in much of the basin, as to be in a gas generative stage.

Other than a non commercial oil discovery in the Hungarian portion of the basin, only gas fields have been discovered in Neogene reservoirs. Substantial CO_2 is associated with the hydrocarbon gas, presumably due to thermal decomposition of carbonate rocks of the underlying nappes.

MIGRATION: Timing of migration is favorable with reference to trap formation. Vertical migration appears common.

RESERVOIR ROCKS: The principal reservoirs are in the Neogene basin fill, particularly within the Badenian, Sarmatian, and lower Pannonian sequences of Miocene age. Gas is produced from lower Pannonian conglomerate, marl, and sandstone and from upper Pannonian sandstones. Potential reservoirs include occasional biohermal buildups.

Fractured and weathered metamorphic and igneous Paleozoic rocks and Mesozoic carbonates and sandstones of the basement nappes are inferred as reservoirs.

TRAPS AND SEALS: Structural, stratigraphic and combination types, include anticlines, growth faults, compaction features over basement highs and pinchouts in fluvial, shallow water, and turbidite sandstones and conglomerates, and unconformity traps, particularly at the regional unconformity between middle Miocene synrift and Pannonian postrift rocks.

Basement traps include structural and paleotopograpic highs and porosity zones at the unconformity, and internal traps in nappes, including anticlinal features and elevated thrust sheets. Traps are sealed by associated fine-grained Tertiary rocks and impervious rocks in the basement.

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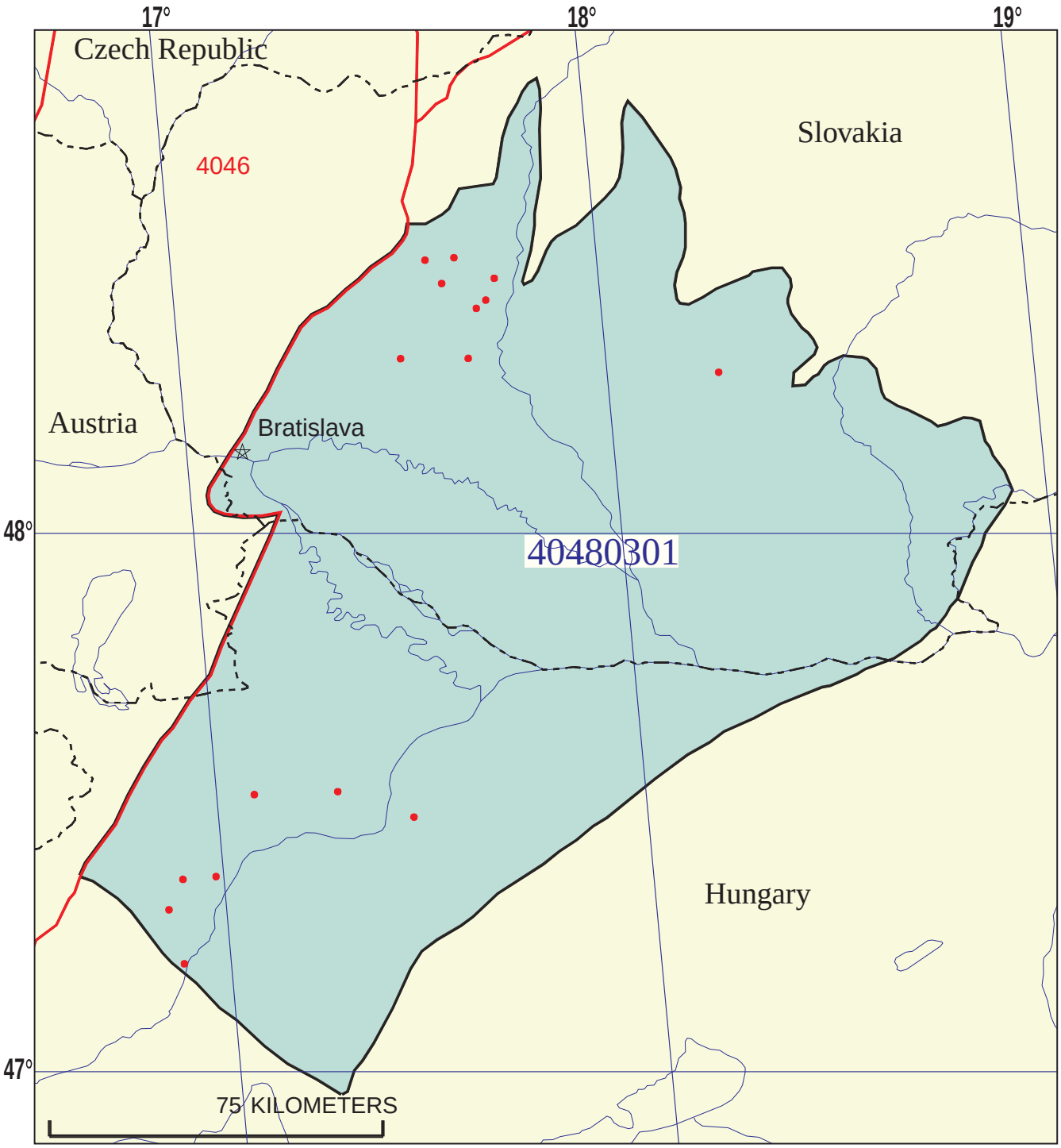

Danube Basin
Assessment Unit - 40480301

EXPLANATION

- Hydrography
- Shoreline
- 4048 Geologic province code and boundary
- Country boundary
- Gas field centerpoint
- Oil field centerpoint
- 40480301 Assessment unit code and boundary

Projection: Robinson. Central meridian: 0

SEVENTH APPROXIMATION
NEW MILLENNIUM WORLD PETROLEUM ASSESSMENT
DATA FORM FOR CONVENTIONAL ASSESSMENT UNITS

Date:……..	6/1/99		
Assessment Geologist:……..	G.L. Dolton		
Region:……..	Europe	Number:	4
Province:……..	Pannonian Basin	Number:	4048
Priority or Boutique……	Priority		
Total Petroleum System:……	Danube Neogene	Number:	404803
Assessment Unit:……	Danube Basin	Number:	40480301
* Notes from Assessor	Lower 48 growth factor.		

CHARACTERISTICS OF ASSESSMENT UNIT

Oil (<20,000 cfg/bo overall) **or** Gas (≥20,000 cfg/bo overall):… Gas

What is the minimum field size?……. 1 mmboe grown (≥1mmboe)
(the smallest field that has potential to be added to reserves in the next 30 years)

Number of discovered fields exceeding minimum size:…… Oil: 0 Gas: 5
Established (>13 fields) _____ Frontier (1-13 fields) X Hypothetical (no fields) _____

Median size (grown) of discovered oil fields (mmboe):
1st 3rd _____ 2nd 3rd _____ 3rd 3rd _____
Median size (grown) of discovered gas fields (bcfg):
1st 3rd 13.9 2nd 3rd 124.9 3rd 3rd _____

Assessment-Unit Probabilities:

Attribute	Probability of occurrence (0-1.0)
1. **CHARGE:** Adequate petroleum charge for an undiscovered field ≥ minimum size……	1.0
2. **ROCKS:** Adequate reservoirs, traps, and seals for an undiscovered field ≥ minimum size……	1.0
3. **TIMING OF GEOLOGIC EVENTS:** Favorable timing for an undiscovered field ≥ minimum size	1.0

Assessment-Unit GEOLOGIC Probability (Product of 1, 2, and 3):…….. 1.0

4. **ACCESSIBILITY:** Adequate location to allow exploration for an undiscovered field ≥ minimum size…… 1.0

UNDISCOVERED FIELDS

Number of Undiscovered Fields: How many undiscovered fields exist that are ≥ minimum size?:
(uncertainty of fixed but unknown values)

Oil fields:……min. no. (>0)	_____	median no.	_____	max no.	_____
Gas fields:……min. no. (>0)	1	median no.	5	max no.	10

Size of Undiscovered Fields: What are the anticipated sizes (**grown**) of the above fields?:
(variations in the sizes of undiscovered fields)

Oil in oil fields (mmbo)……min. size	_____	median size	_____	max. size	_____
Gas in gas fields (bcfg):……min. size	6	median size	20	max. size	300

Assessment Unit (name, no.)
Danube Basin, 40480301

AVERAGE RATIOS FOR UNDISCOVERED FIELDS, TO ASSESS COPRODUCTS

(uncertainty of fixed but unknown values)

Oil Fields:	minimum	median	maximum
Gas/oil ratio (cfg/bo)……			
NGL/gas ratio (bngl/mmcfg)……			
Gas fields:	**minimum**	**median**	**maximum**
Liquids/gas ratio (bngl/mmcfg)……	10	20	30
Oil/gas ratio (bo/mmcfg)……			

SELECTED ANCILLARY DATA FOR UNDISCOVERED FIELDS

(variations in the properties of undiscovered fields)

Oil Fields:	minimum	median	maximum
API gravity (degrees)……			
Sulfur content of oil (%)……			
Drilling Depth (m) ……			
Depth (m) of water (if applicable)……			
Gas Fields:	**minimum**	**median**	**maximum**
Inert gas content (%)……	2	3	4
CO_2 content (%)……	0.5	10	78
Hydrogen-sulfide content (%)……			
Drilling Depth (m)……	500	1500	5000
Depth (m) of water (if applicable)……			

Assessment Unit (name, no.)
Danube Basin, 40480301

ALLOCATION OF UNDISCOVERED RESOURCES IN THE ASSESSMENT UNIT TO COUNTRIES OR OTHER LAND PARCELS (uncertainty of fixed but unknown values)

1. Slovakia represents 62 areal % of the total assessment unit

Oil in Oil Fields:	minimum	median	maximum
Richness factor (unitless multiplier):……			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Gas in Gas Fields:	minimum	median	maximum
Richness factor (unitless multiplier):……			
Volume % in parcel (areal % x richness factor):…		60	
Portion of volume % that is offshore (0-100%)……		0	

2. Hungary represents 38 areal % of the total assessment unit

Oil in Oil Fields:	minimum	median	maximum
Richness factor (unitless multiplier):……			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Gas in Gas Fields:	minimum	median	maximum
Richness factor (unitless multiplier):……			
Volume % in parcel (areal % x richness factor):…		40	
Portion of volume % that is offshore (0-100%)……		0	

Danube Basin, AU 40480301
Undiscovered Field-Size Distribution