

Can Surface Geochemical Exploration Be Used to Forecast Production in Oilfield Development? An Example in the Neuquen Basin, Argentina*

H. A. Oстера^{1,2}, M. Fasola³, G. Garbán¹, L. Navarro¹, M. Piedrabuena¹, and G. Malizia¹

Search and Discovery Article #11338 (2020)**

Posted July 6, 2020

*Adapted from oral presentation given at 2019 AAPG Hedberg Conference, Hydrocarbon Microseepage: Recent Advances, New Applications, and Remaining Challenges, Houston, Texas, June 18-20, 2019

**Datapages © 2020 Serial rights given by author. For all other rights contact author directly. DOI:10.1306/11338Oster2020

¹DTP Laboratorios S.R.L., Buenos Aires, Argentina (haoster@dtplaboratorios.com)

²Universidad de Buenos Aires, Buenos Aires, Argentina

³YPF S.A., Buenos Aires, Argentina

Abstract

The ability of surface geochemistry surveys to predict oil and gas accumulations has been proven years ago (e.g. Schumacher et al., 1996, 2002). The Neuquen Basin (west-central Argentina) still has a high potential in the development of mature fields, heavy oils and shale oil, and gas in non-conventional reservoirs (Veiga et al., 2005). Surface geochemical exploration surveys have been carried out there during the last 30 years and, in the last decade, most of them were done in high risk, marginal exploration areas. However, in this basin forecasting of production and reserves has not been fully tested against the results of surface geochemical surveys. We present a case study in the northern part of the Neuquen Basin. The correlation of produced oil and predicted reserves with biogeochemical results show that both can be linked, and the survey results used for oilfield development, in addition to traditional techniques. Moreover, focusing of new wells in biogeochemical anomalies could help to save time, resources, and enhance the development of challenging fields.

Selected References

Schumacher, D., 1996, Hydrocarbon-Induced Alteration of Soils and Sediments, *in* D. Schumacher and M.A. Abrams (eds.), Hydrocarbon Exploration and its Near-Surface Expression: AAPG Memoir 66, p. 71-89.

Schumacher, D., and L.A. LeSchack, 2002, Surface Exploration Case Histories Applications of Geochemistry, Magnetics, and Remote Sensing: AAPG Studies in Geology 48, 486 p.

Veiga, G.D., L. Spalletti, J.A. Howell, and E. Schwartz, 2005, The Neuquén Basin: A Case Study in Sequence Stratigraphy and Basin Dynamics: The Geological Society, London, Special Publication 252, 336 p.

AAPG HEDBERG

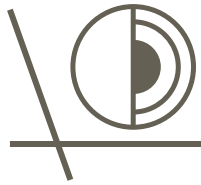
**Hydrocarbon
Microseepage: Recent
Advances, New
Applications, and
Remaining Challenges**

18-20 June 2019 • Houston, TX

**Can surface geochemical exploration be used to
forecast production
in oilfield development? An example in the Neuquen
Basin, Argentina**

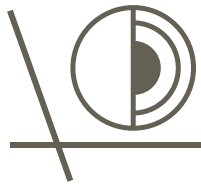


H. A. Oстера, M. Fasola, G. Garbán, L. Navarro, M. Piedrabuena & G. Malizia



Outline

- Introduction
- Geological setting
- Geochemical survey
- Methodology
- Results and oil production
- Conclusions

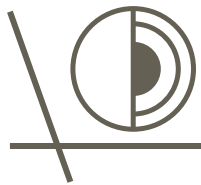


Introduction

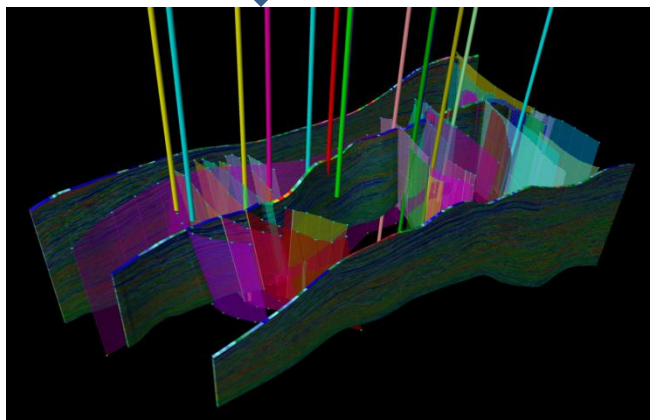
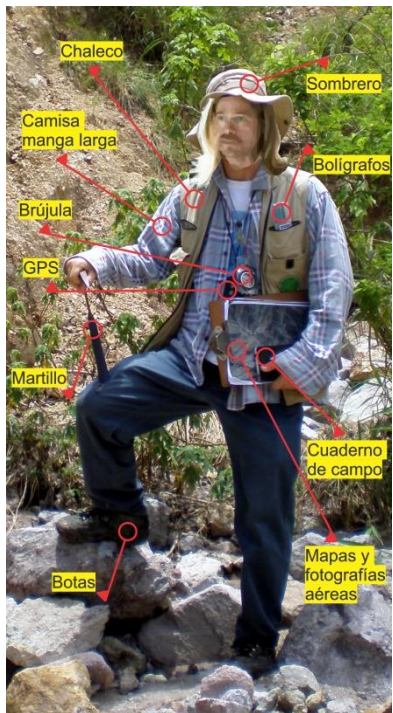
The ability of surface geochemistry surveys to predict oil & gas accumulations has been proven since many years ago. Different techniques, in many countries, in all sedimentary basins, off shore and on shore have proven that they are capable of finding productive hydrocarbon fields.

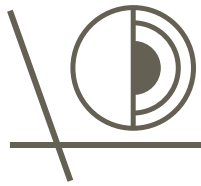
However, although the evidence have been overwhelming, still today many explorationists and oilfield developers do not use surface geochemical techniques arguing their doubts and “lack of faith” in these techniques (as if they were based in an obscure and poorly known dogma of faith. . .).

So, when we have the possibility to demonstrate that our techniques are useful, in oilfield development and can help to save money, even in non-optimal conditions, we feel that it is necessary to show these results. The oil industry must know that we can help in each stage of the productive cycle.



Introduction





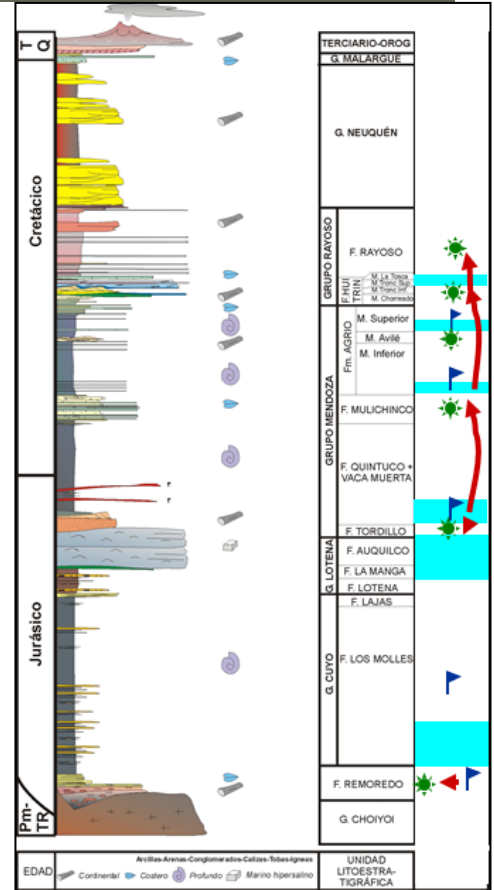
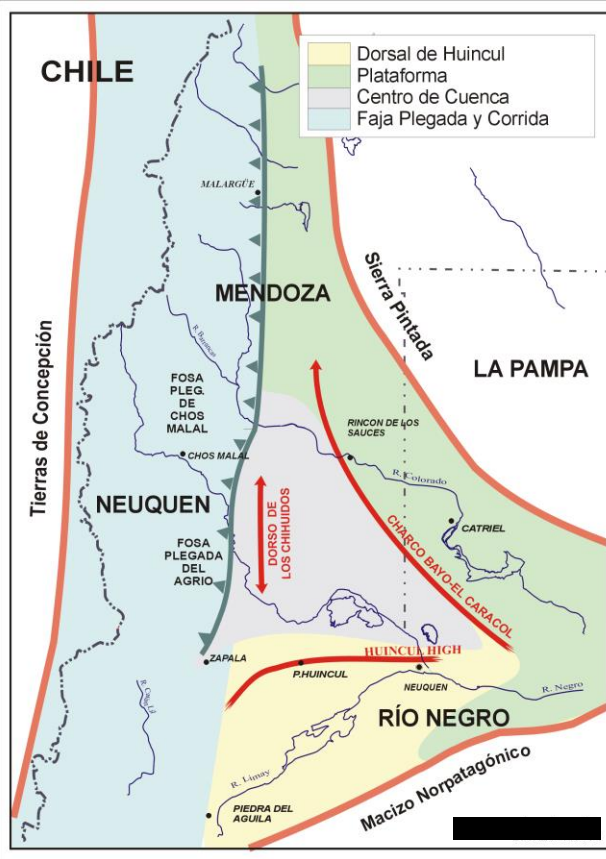
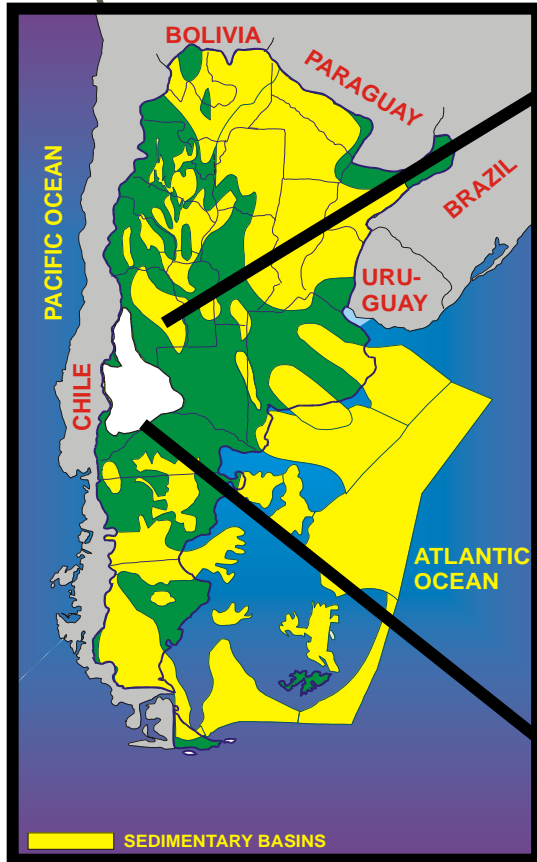
Geological setting

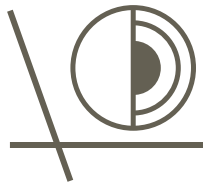
The Neuquen Basin (west-central Argentina) still have a high potential in the development of mature fields, heavy oils and shale oil/ gas in non-conventional reservoirs.

Surface geochemical exploration surveys have been carried out there during the last 30 years and, in the last decade, most of them were done in high risk, marginal exploration areas. However, in this basin forecasting of production and reserves has not been fully tested against the results of surface geochemical surveys.



Geological setting





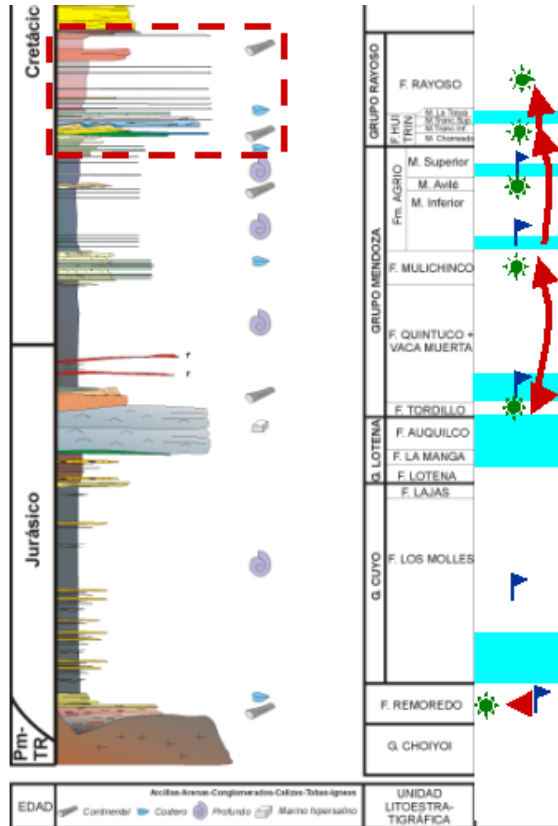
Geological setting

Source rock

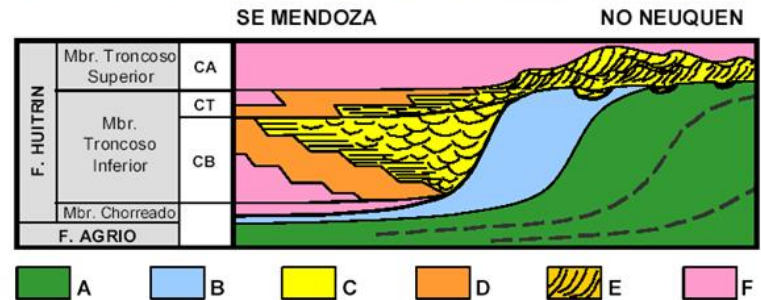
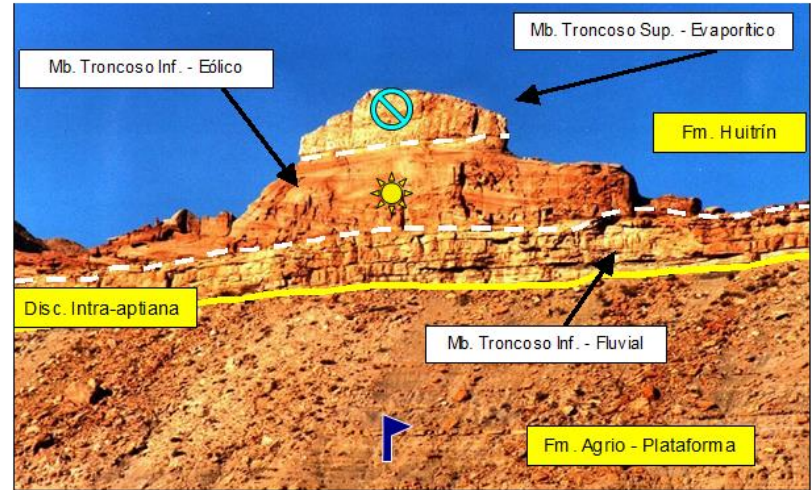




Geological setting



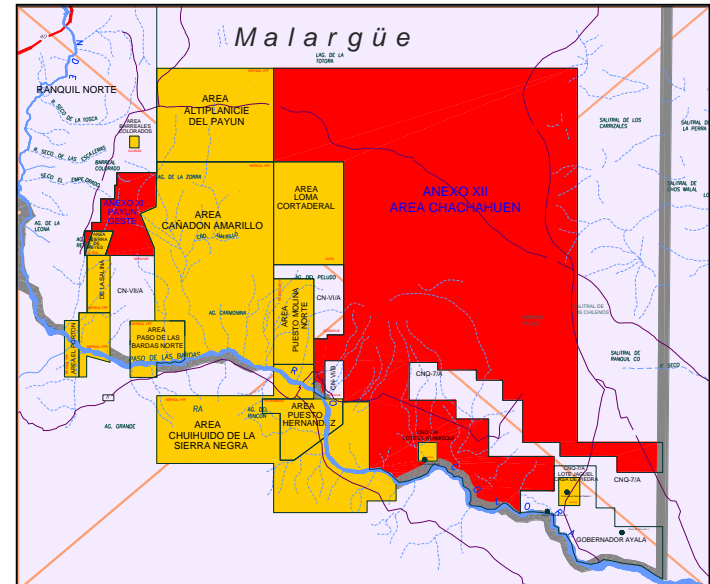
Reservoir





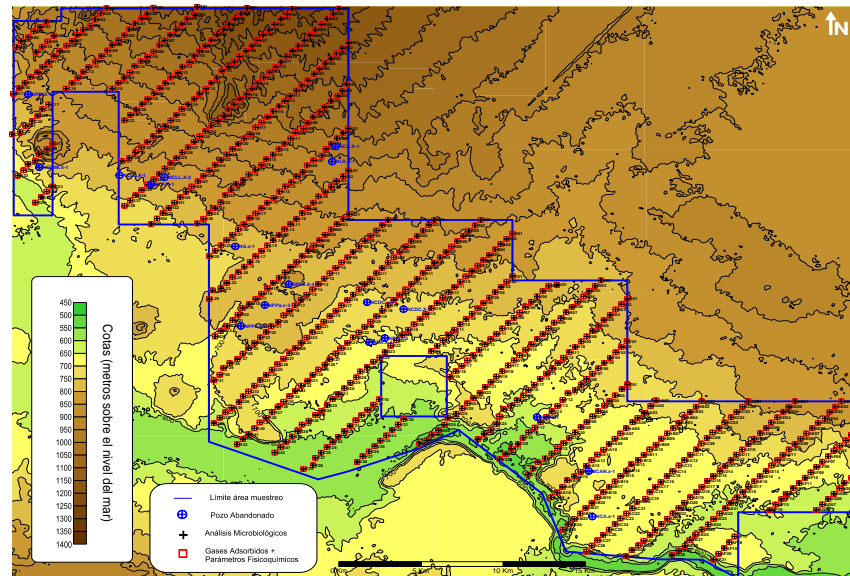
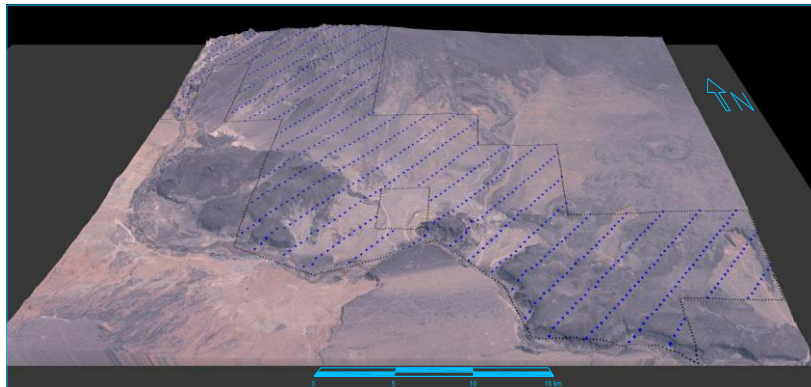
Surface geochemical survey

A surface geochemical survey was performed in 2012 before the full development of the oilfield in the area. It included microbiological (conventional-EMHI and DNA-DBEH) and adsorbed gas analysis. Considered as a regional study, 800 samples were taken, with a sampling interval of 500 meters and 2000 meter between geochemical lines.





Surface geochemical survey





Surface geochemical survey



Landscape





Data

- Secretary of energy, Chapter IV.
- Database of well production for oilfield.
- History of well production.



Reserves calculation

- Analysis of decline curve well by well .
- Remnant reserves



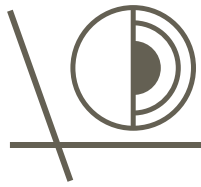
Revision of geochemical surveys

- Oilfield selection.
- Maps.
- Reports



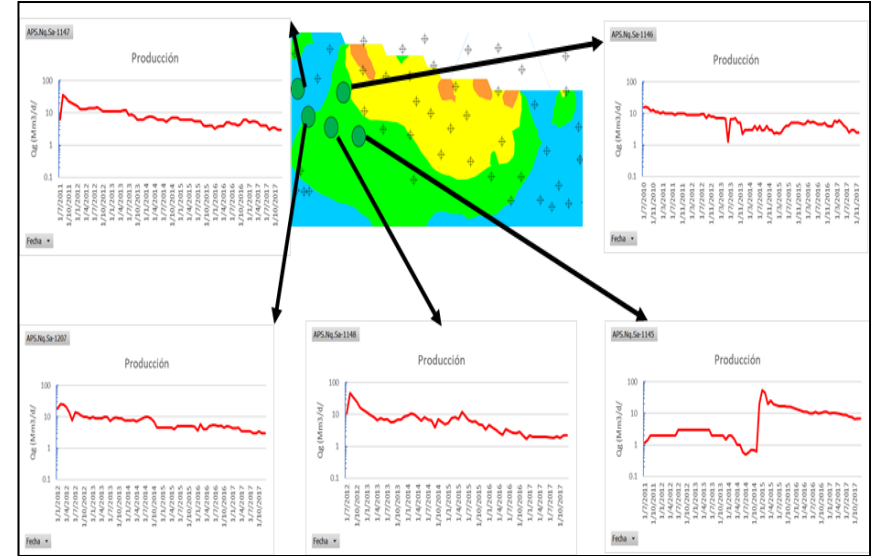
Integration

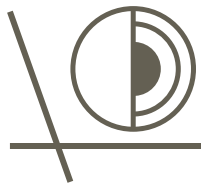
- Scales.
- Reserve dot maps
- Production and reserve analysis after geochemical surveys.



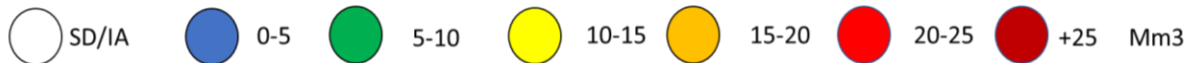
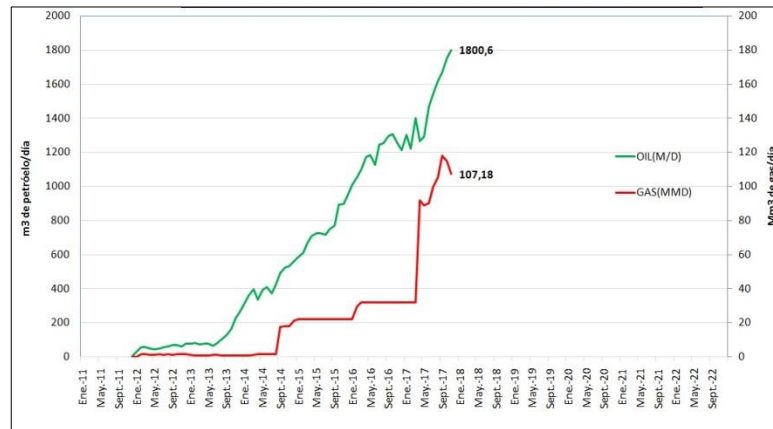
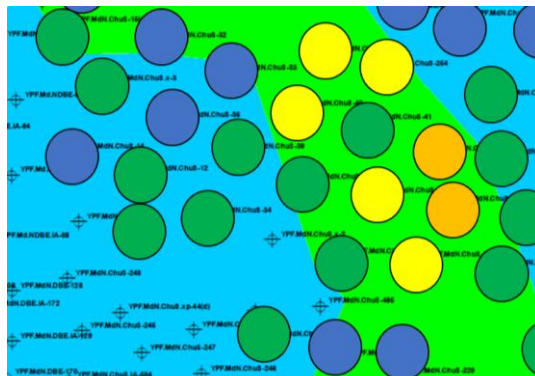
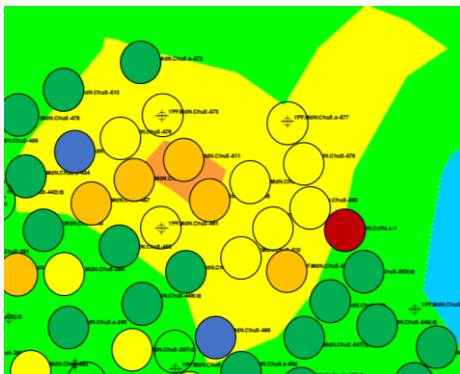
Methodology

The amount of produced and remaining oil since 2012 to 2018 was determined using well data taken from published reports from the Energy Ministry; wells were selected taking into account the distance from sampling sites. Due to the fact that the distance between samples (inline) is 500 meters, every well in a range of 400 meters was included in the analysis.





Results & oil production

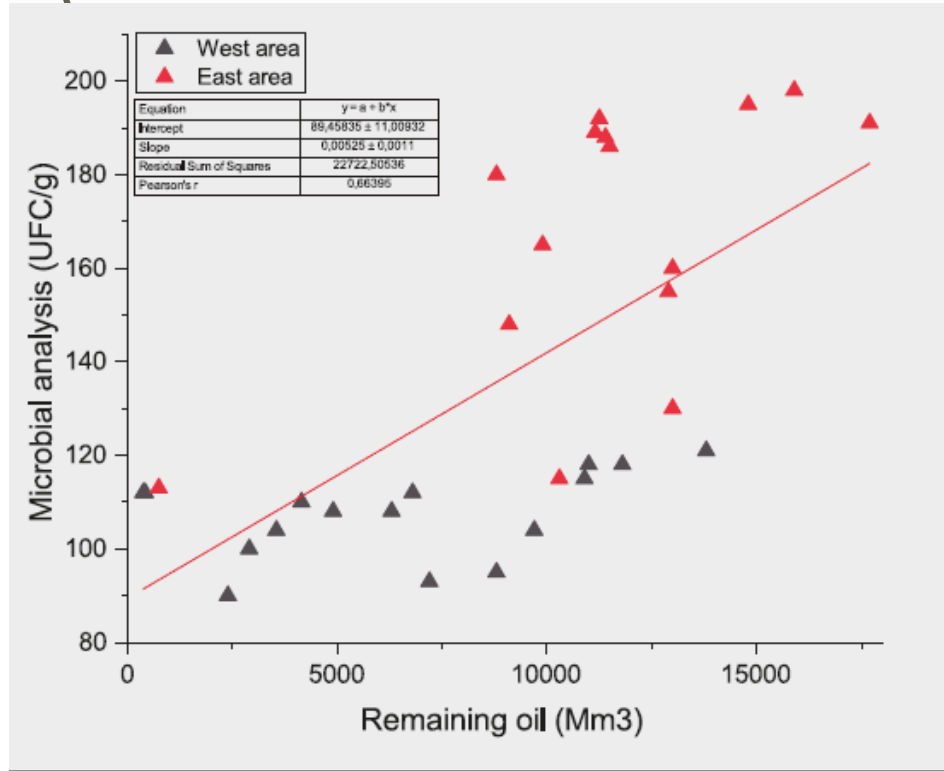


Oil: 1800 M³/day

Gas: 107 MM3/day



Results & oil production

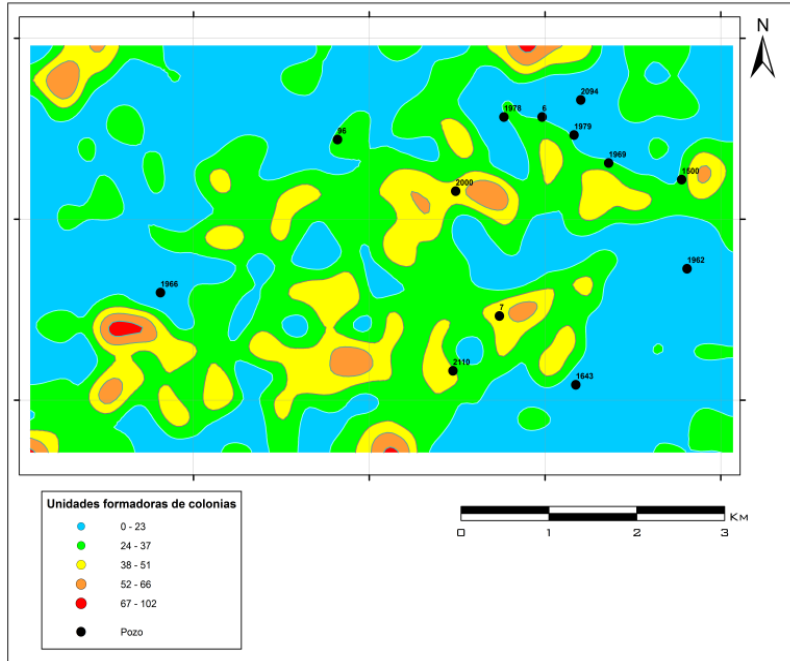


The microbiological analysis showed a positive correlation with produced and remaining oil values in the study area. The eastern part of the area presents higher microbial values in comparison to the western, and this statement also matches with the fact that the oil reserves in the Eastern sector are significantly higher than in the western zone.

Geochemical results also proved the effectiveness of gas survey to predict hydrocarbon type.



Results & oil production : other oilfields



Other oilfields in different locations and basins have shown a close correlation between microbiological anomalies and production. The existence of biogeochemical anomalies in this type of oilfields can help to focus the oilfield development in the most promising areas, avoiding undesirable risks and contributing to identify the remnant oil in the reservoirs (Ostera *et al.*, 2018).



Conclusions

Surface geochemical exploration has been tested in order to prove its ability to predict oil production and reserves. The correlation of produced oil and predicted reserves with bio-geochemical results show that both can be linked and the survey results used for oilfield development, in addition to traditional techniques. Moreover, focusing of new wells in bio-geochemical anomalies could help to save time, resources and enhance the development of challenging fields.

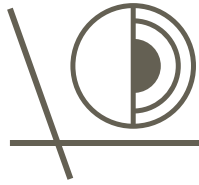


So, the answer for the question is:

Yes, surface bio-geochemical techniques (SBGT) can be used to forecast production in oilfield development and indeed can also be used for mature fields.

This expands the possibilities of SBGT beyond the traditional limits.

It is necessary an appropriate communication with the engineers that usually command the expansion of oilfields after the first discoveries.



Thanks for your attention!