Geochemical characterization of oil seep and oil samples from wells of adjacent areas, in order to determine the origin, by oil-oil correlation, two study cases, Monagas, Venezuela

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This paper was selected for presentation by an ALAGO Scientific Committee following review of information contained in an abstract submitted by the author(s).

Introduction
The geochemical characterization is a specialty widely used in the oil industry, with multiple applications that help to understand the petroleum system in the area. Below are two study cases, in which geochemical characterization was applied to determine the source of oil seeps, in the area North of Monagas in Venezuela (figure 1). The samples were analyzed by general and special geochemical techniques, to determine the origin and maturity of these, as well as any possible oil-oil correlation, to determine the source of the spill.

Methods
For the evaluation and characterization of the samples collected, the following geochemical analyzes were carried out: SARA, GC on saturates fraction and GC-MS of saturates and aromatic fraction (figure 2).

Results and discussions
This paper presents two cases of oil leaks from old fields of NE Venezuela. The first Case is about geochemical characteristics of an oil sample A-1 from a spill in the area C, and an oil sample B-1 from well B located in the area C. The results showed clear differences between the samples, indicating a negative oil-oil correlation between oil samples A and B, which indicates that the oil sample A does not come from wells in the area, although samples are associated with a carbonate rock deposited under anoxic conditions and a marine origin, the differences were found in the maturity and biodegradation.

The second Case is about geochemical characteristics of oil seepage samples E-1, E-2, E-3, E-4, E-5, E-6, detected in the field D and an oil sample F-1, from well F, located in the field D, in order to conduct an evaluation to determine if these oil samples correspond to oil seepages or oil spills caused by abandoned wells in the area. The results suggest that the oil seepage samples and the well oil sample are positively correlated, indicating that the abandoned well is leaking oil, in addition, the characterization determined that the samples are associated with a carbonate rock deposited under anoxic conditions, a marine origin and maturity is between early and oil window. Besides the lack of paraffins and isoprenoids and the presence of the compound 25-Norhopane established that the samples show a high degree of alteration (grade 8) due to the effect of biodegradation and/or oxidation of the compounds.

Conclusions
* In case 1, the results indicate that the oil samples A-1 and B-1 are associated to organic matter type II of marine origin, deposited under reducing conditions, but the oil sample B-1 is more mature and less biodegraded than the oil sample A-1. In addition, sample A-1 showed an abundance of branched and naphthenic compounds that are not in the sample B-1, which could indicate a possible mixture of predominantly marine oil source with a lower proportion of a biodegraded oil. These results indicate that the samples A-1 and B-1 do not have a positive correlation, therefore the oil sample A-1 does not come from wells in the area.
In case 2, the results indicate that the oil seepage samples (E-1 to E-6) and the well oil sample (F-1), are associated to organic matter type II of marine origin, deposited under reducing conditions and a maturity between medium to oil window, in addition, the characterization determined that the oil seepage samples and the oil well sample are positively correlated, indicating that the oil seepages samples (E-1 to E-6) taken around the well (F-1) are the result of a spill of this. Besides, the lack of paraffins and isoprenoids and the presence of the compound 25-Norhopane established that the samples show a high degree of alteration, this is because, the samples of oil seepages were taken at the surface, and the well has been closed for a long time.

**Acknowledgements**
The authors thank to PDVSA Intevep all their support that made possible to carry out this research.

**References**
