24/2/2021

Oil pollution report

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Here we present a short preliminary report for the composition of the oil pollution in Israel shores starting from January 17. The analyzed sample was collected in Bat-Yam beach on the 20/2/2021. Water associated with the sample was dried by using magnesium sulfate. The dry sample was fractionated to saturates, aromatics, resins and asphaltenes by column chromatography (SARA). The results are: Saturates =39.4%, Aromatics = 26.5%, Resins =3.6%, Asphaltenes = 30.5% (Fig.1).

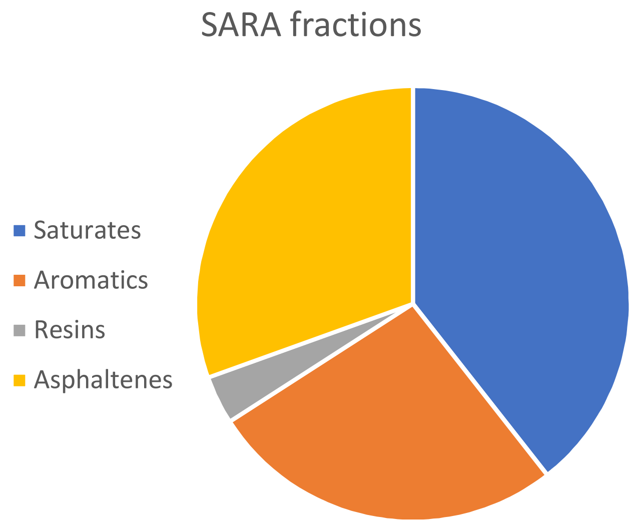

Fig.1. Pie-chart demonstrating the abundance of SARA fractions in the studied sample.

The TIC of the saturate fraction (Fig.2) demonstrated a large range of *n*-alkanes from C_{10} to C_{42} with presence of iso- and cycloalkanes, hopanes (Fig.3) and steranes (Fig.4). Such observation indicated the analyzed hydrocarbon sample is likely a crude oil rather than tar or other refinery product.

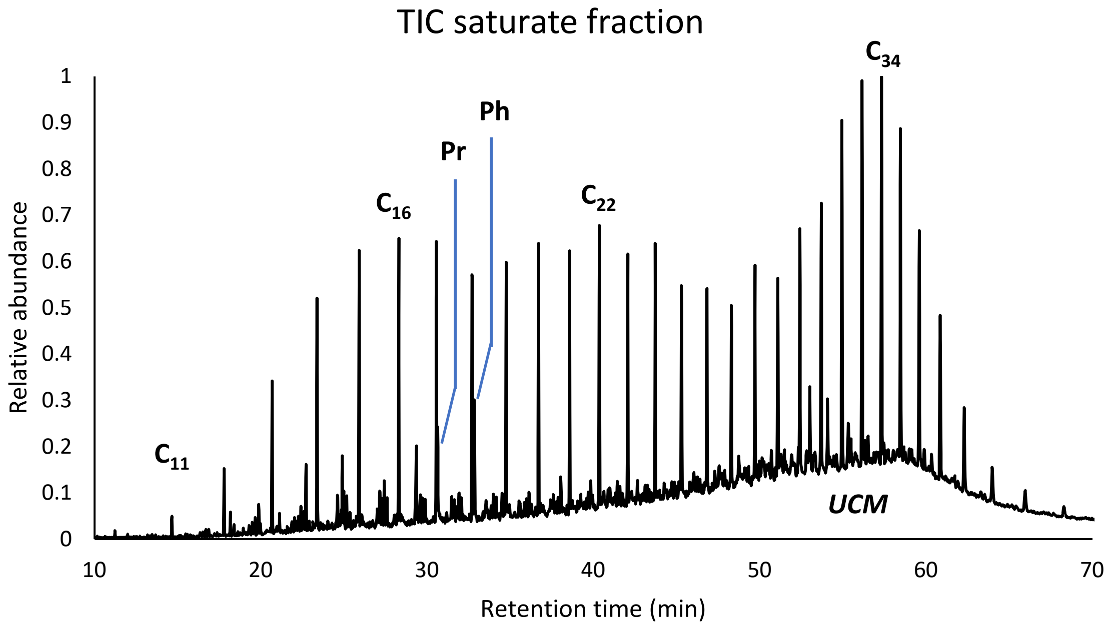

Fig.2. Total ion current (TIC) GC-MS chromatogram of the saturate fraction. Several *n*-alkanes are identified by their carbon number. Pr-pristane, Ph- phytane, UCM-unresolved complex mixture.

The TIC chromatogram (Fig. 2) obtained suppression of the n- and the iso- alkanes compounds at the lower molecular part of the chromatogram (left wing) and the enhancement of the heavier compounds (rite wing) indicates that the oil probably experienced considerable evaporation. The loss of volatile compounds is usually coupled with a buildup of less volatile, high-molecular-weight, aliphatic compounds such as those observed in the range around n-C34. In addition, an increase of the UCM hump is visible which further supports the weathering experienced by the sample.

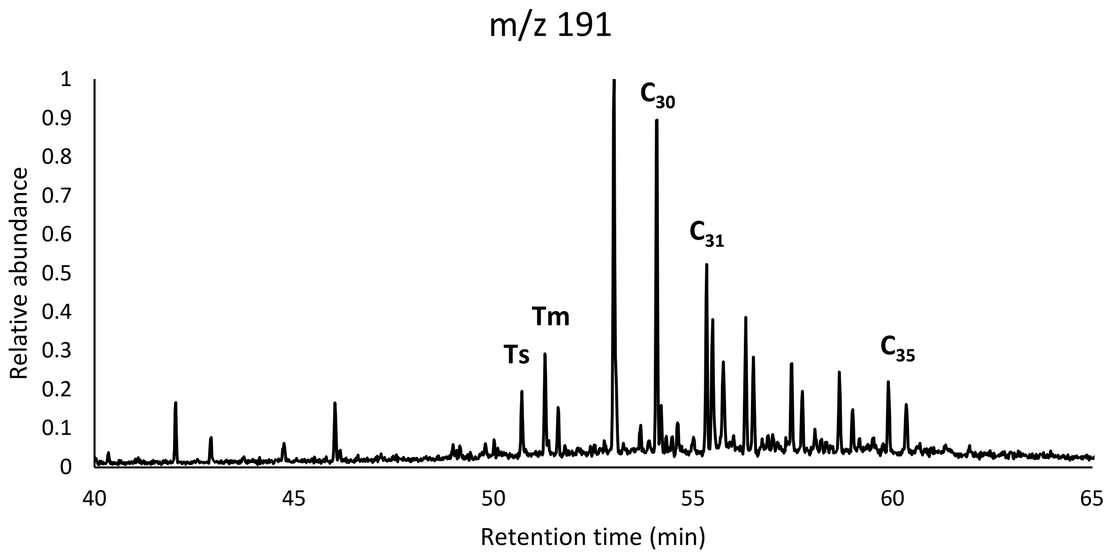

Fig.3. Partial GC-MS (SIM) chromatogram showing hopane (m/z 191) distribution in the studied sample. Few key compounds are identified.

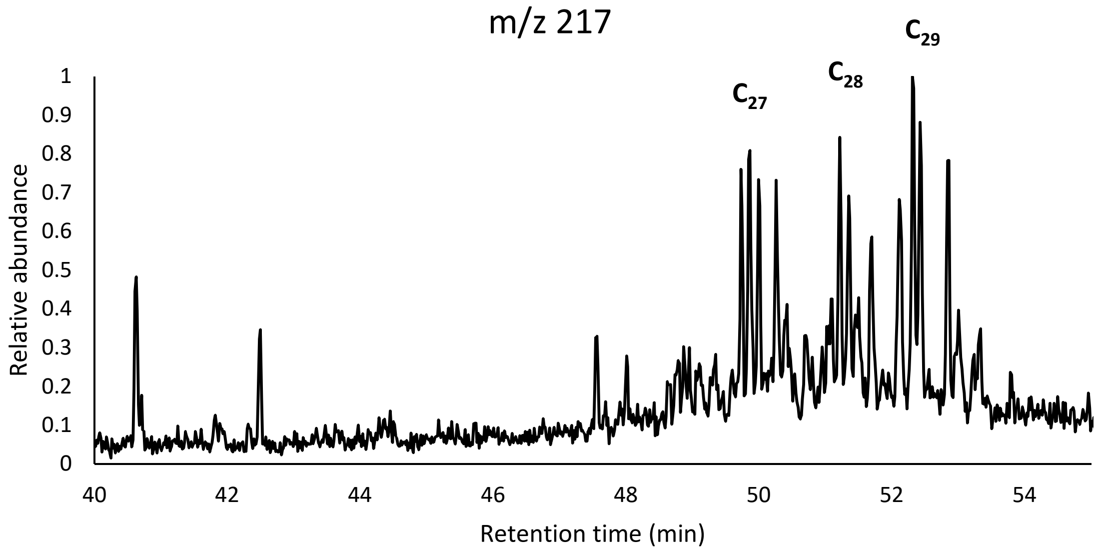

Fig.4. Partial GC-MS (SIM) chromatogram showing sterane distribution (m/z 217) in the studied sample. The main groups of steranes are identified.

In the aromatic fraction (Fig.5), the very low content of naphtalene and C_1-naphtalenes relative to longer, C_2 and C_3 naphtalene, is indicative of weathering, likely by water washing. Studies of oil spills weatherting demonstrated the removal of all short benzenes takes place when oil evaporation reached ~45% (Wang and Fingas, 1995)- in the studied sample the content of benzenes is very low which may further support weathering of the sample by evaporation.

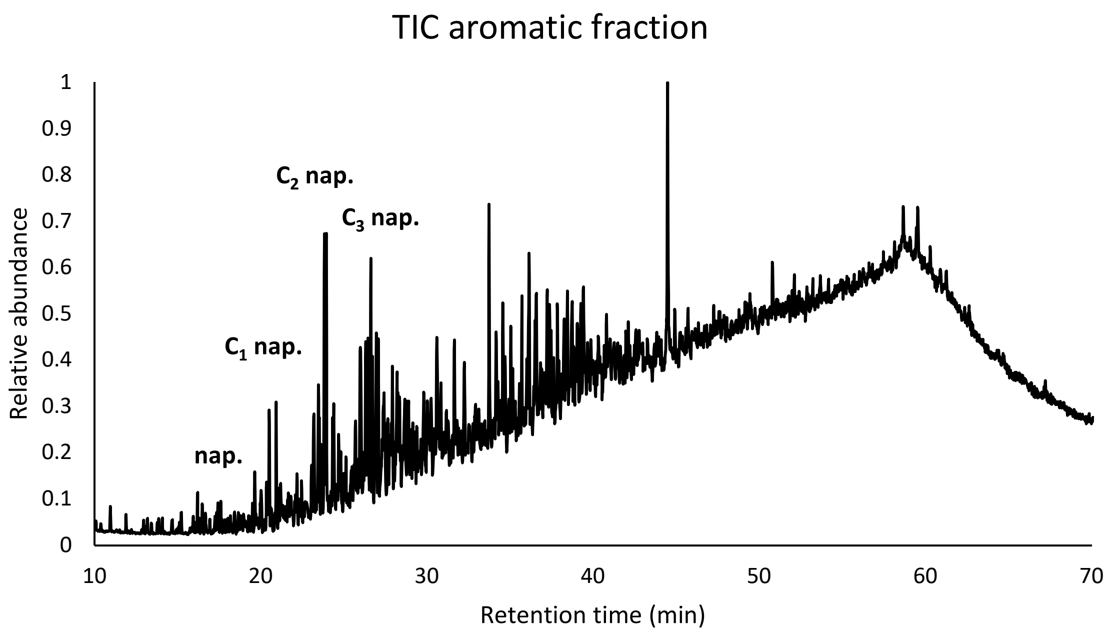

Fig. 5- Total ion current (TIC) GC-MS chromatogram of the aromatic fraction. Nap.- naphthalene.

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Additional results:

Parameter	Value
n-C_{17}/pristane	2.46
n-C_{18}/phytane	1.40
Pristane/Phytane	0.57
CPI	0.95
TAR	0.74
Dibenzothiophene/phenanthrene (DBT/Phen)	1.11
MDR	1.75 (corresponding Tmax of 433°C; Radke et al., 1988)
MPI-1	0.44 (corresponding %Rc of 0.65; Radke et al., 1988)