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The influence of water salinity on the Raman spectra of dissolved gases

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Substances indicators of marine hydrocarbon deposits

Name	Formula
Methane	CH_4
Ethane	C_2H_6
Propane	C_3H_8
Butane	C_4H_{10}
Pentane	C5H12
Hydrogen sulfide	H2S
Nitrogen	N
Carbon dioxide	CO2

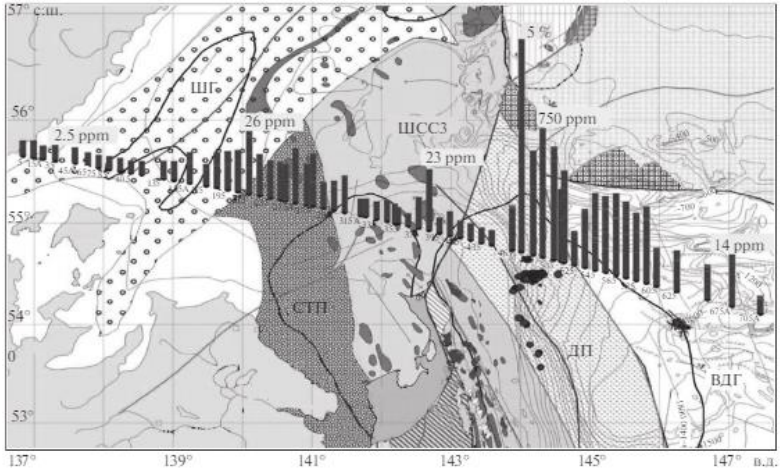

Figure 2 – Gas distribution in the bottom sediments on the tectonic map

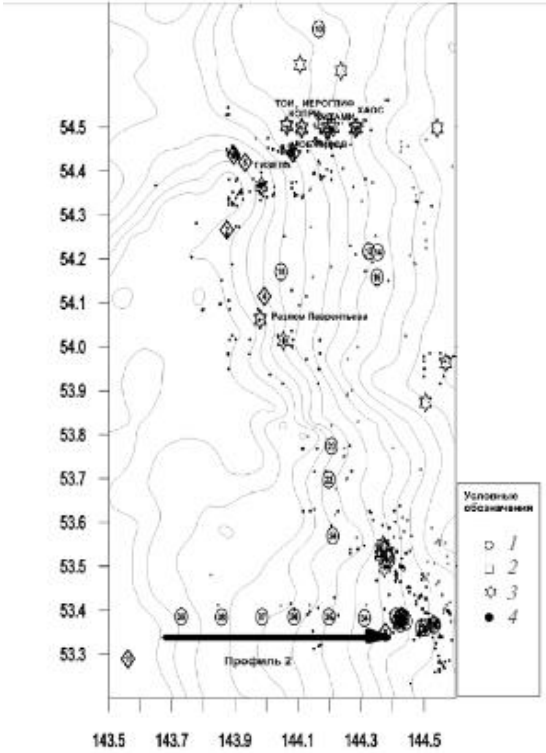

Figure 1 - Gas release into surface waters scheme

[Spatial distribution of methane fluxesat the water-atmosphere boundary in the Sea of Okhotsk 2019 R. B. Shakirov, O. V. Mishukova Geosystems of Transition zones, 2019, vol. 3, no. 1, pp. 107-123]

Water salinity as the indicator

- Indicator of climate change.
- Plays a fundamental role in global ocean circulation and water cycle.
- Indicator in determining the thermal structure of the ocean as well as the water density.
- Influence on the global ice cover and the planetary albedo.

Determining water salinity methods

- Water chlorine content determination
- Empirical determination of the ratio of the seawater and standard solution conductivity
- Satellite data
- Optical methods of spectrometry

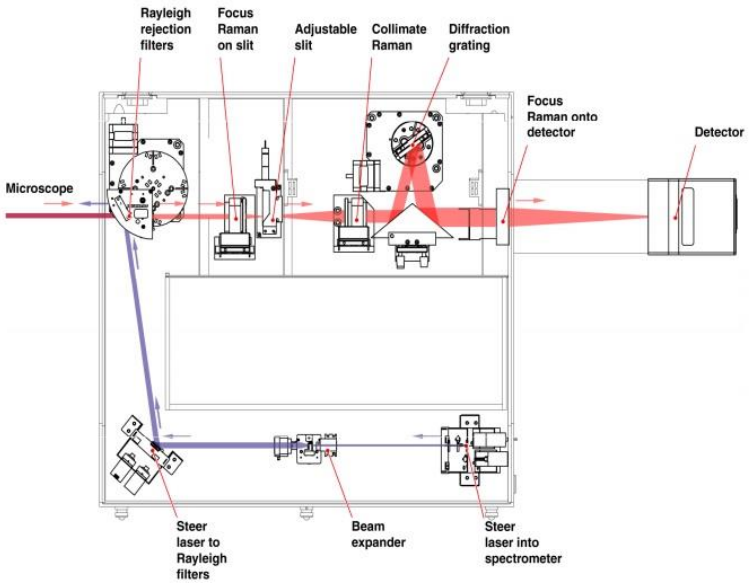

Figure 3 - Optical scheme

Figure 4 - Raman spectrometer

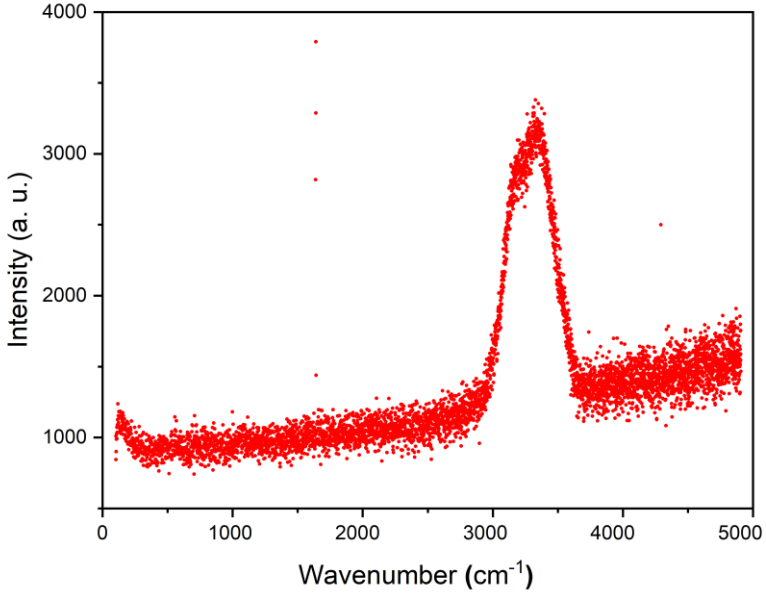

Figure 5 - Raman spectrum of saline solution

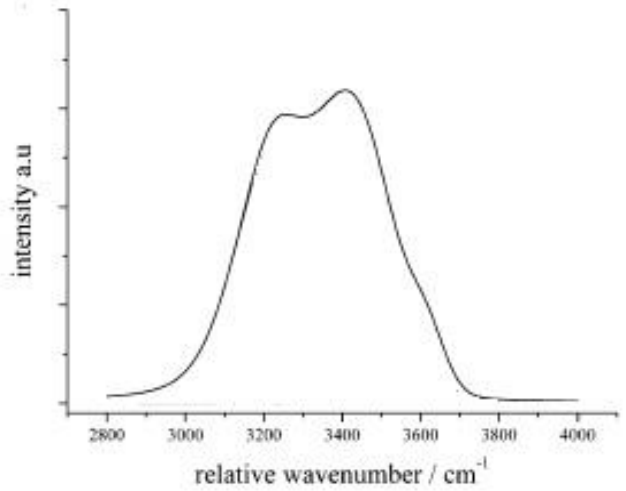

Figure 6 - Raman spectrum of pure water

Figure 7 - The process of gas dissolving by bubbler using

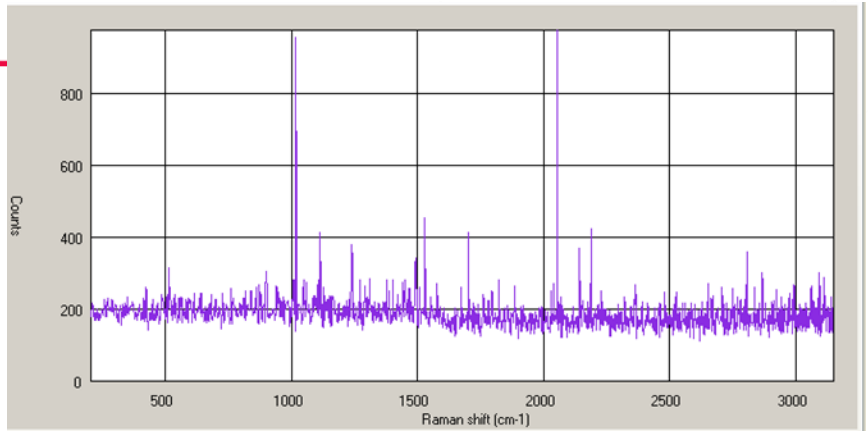

Figure 8 - Dark signal

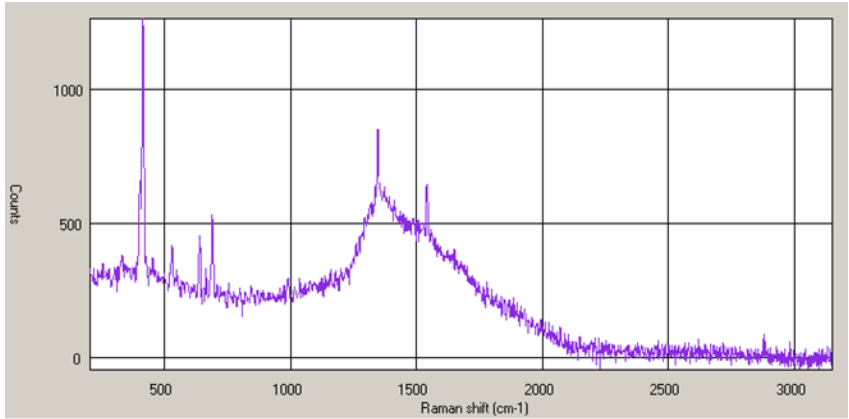

Figure 9 - Background signal

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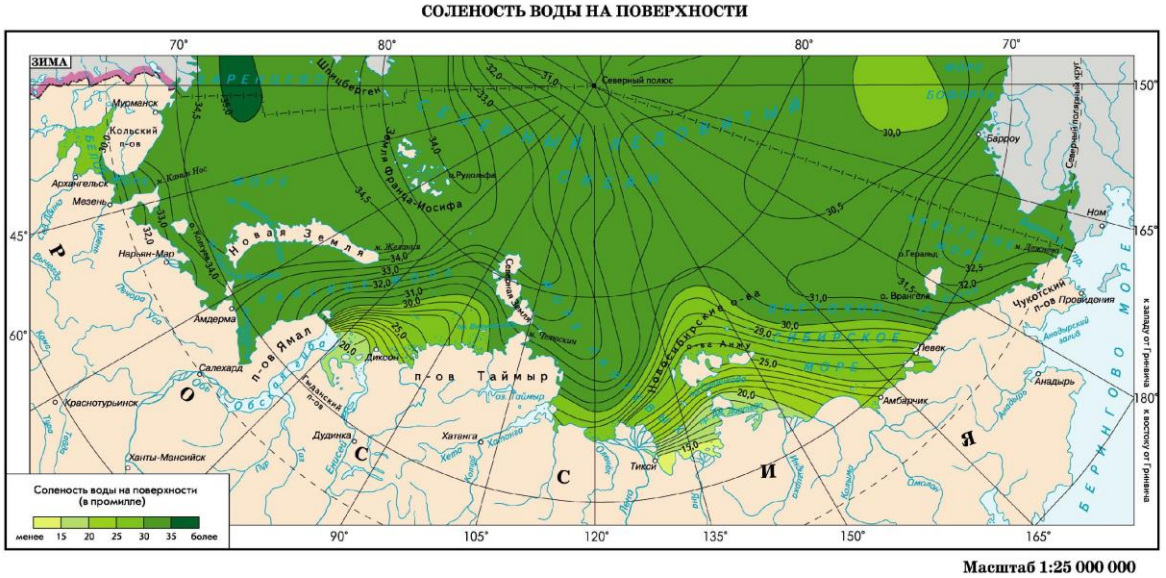

Figure 10 - Arctic seas salinity

[https://geographyofrussia.com/]

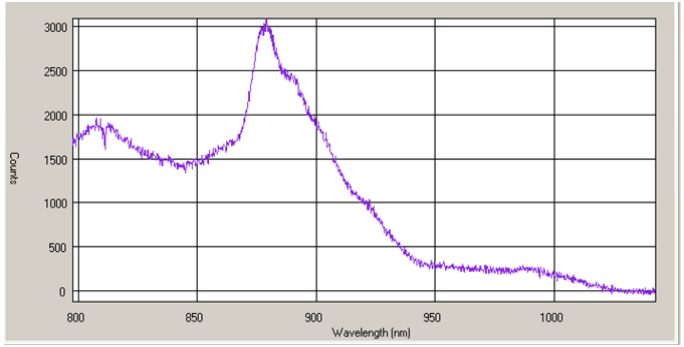

Figure 11 - Processed signal of nitrogen dissolved in a saline solution at a concentration of NaCl 25‰

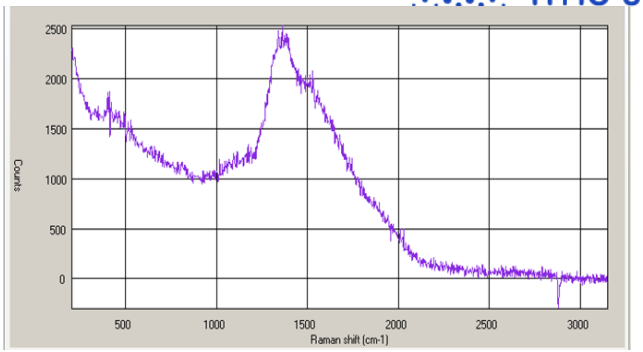

Figure 11 - Processed signal of nitrogen dissolved in a saline solution at a concentration of NaCl 30‰

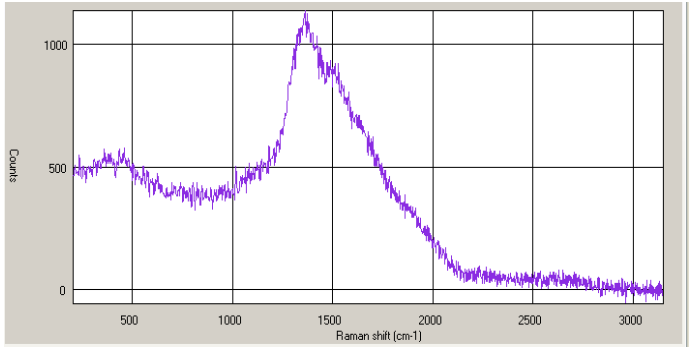

Figure 11 - Processed signal of nitrogen dissolved in a saline solution at a concentration of NaCl 35‰

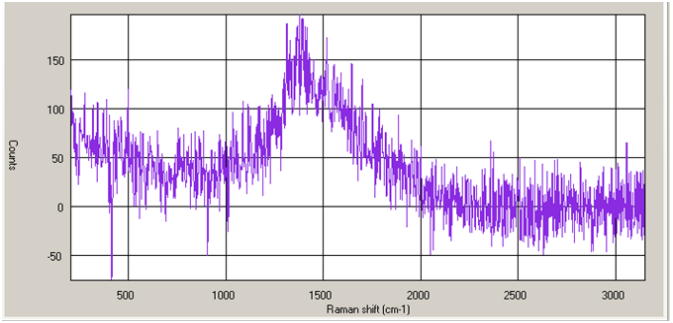

Figure 11 - Processed signal of nitrogen dissolved in a saline solution at a concentration of NaCl 50‰

- The presence of salt in an aqueous solution shows the effect on the morphology of the spectra.
- The peak position can be used to determine the dissolved nitrogen and salinity of an aqueous solution by comparing it with spectra.
- The resulting Raman spectra can be added to an existing database of Raman shifts and what is more can be used as a reference points as a part of lidar complexes and environmental monitoring systems.

Thank you for attention!

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