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**Analysis of the parameters of the phenomenon of
two-dimensional horizontal dispersion in a coastal
zone based on tracer studies using a drone
(unmanned aerial vehicle - UAV)**

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Study area

- Research was carried out at the mouth of the Gizdepka River into Puck Bay.
- Gizdepka is a minor watercourse, with a catchment area of 37.2 km².
- The average annual flow rate falls within a range of 0.16 to 0.19 [m³s⁻¹].
- This river passes through an agricultural area and carries typical impurities from this area.





Tracer studies using UAV imaging and fluorometer

- Two substances were used in the research: fluorescein and Rhodamine WT.
- Each session comprised several UAV flights at regular time intervals, and simultaneous manual sampling for fluorometer testing at strictly specified spots.
- The works were conducted in two ways: samples were traditionally collected for marking and photographs were taken using a drone.
- The method of determining the concentration based on color was used
- In this way, the spatial distribution of the tracer concentration was determined



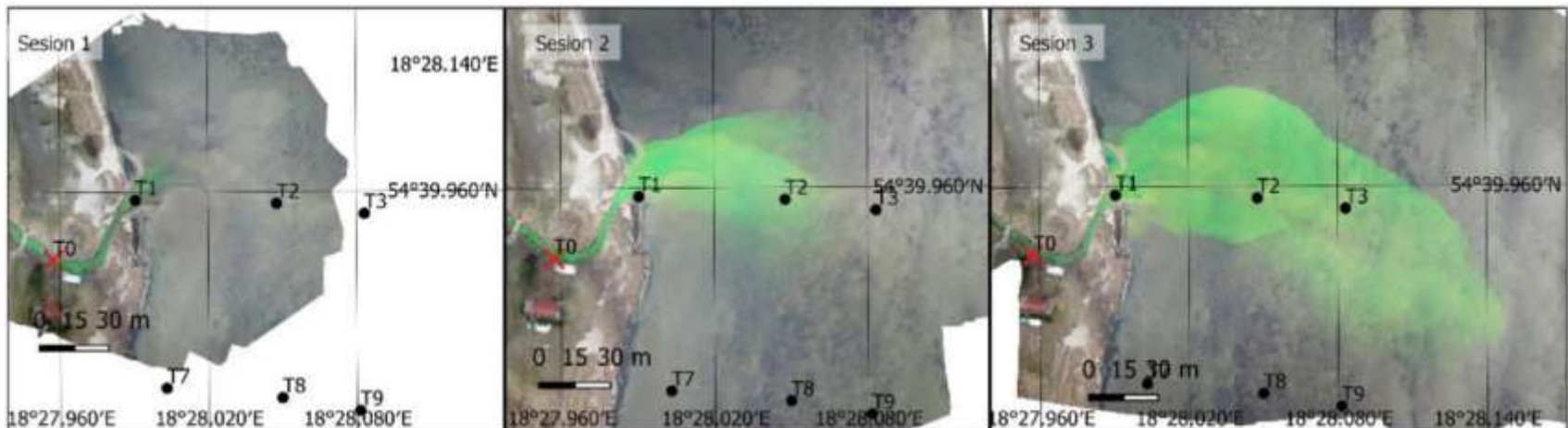


Determination of the dispersion coefficients

- Fischer's statistical method was used to calculate the coefficient of the longitudinal dispersion D_L [m^2s^{-1}]:

$$D_L = \frac{(\bar{u})^2 (\sigma_2^2 - \sigma_1^2)}{2\Delta T}$$

- where: u – average spreading velocity of the tracer [ms^{-1}], σ_i – standard deviation of i series, ΔT – time interval between series peaks [s].
- This coefficient was calculated for the estuary section of the river and then calculated in the coastal zone.





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FUTURE IS CHALLENGE**