SATELLITE DATA FOR INVESTIGATION OF RECENT STATE AND PROCESSES IN THE SIVASH BAY

EMECS 11 – Sea Coasts XXVI Joint Conference "Managing Risks to Coastal Regions and Communities in a Changing World"

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The aim?

Main aim of the study to investigate recent state and changes of the characteristics and processes in the basin using satellite data.

*Landsat scanners TM, ETM+, OLI, TIRS together with MODIS and AVHRR were used. Additionally NOMADS NOAA and MERRA meteorological data were analyzed.*

The next topics are discussed:

- Changes of the sea surface temperature, ice regime and relation with salinity.
- Coastal line transformation – long term and seasonal, wind impact.
- Manifestation of the Sea of Azov water intrusions through the Arabat spit, preferable wind conditions.
SEA SURFACE TEMPERATURE

Monthly mean sea surface temperature data for 2001-2013

Sea of Azov

the Southern Sivash
SEA SURFACE TEMPERATURE

NOAA-18
28 Apr 2006
10:23 GMT

NOAA-19
16 Jun 2012
10:35 GMT

METOP-2
29 Nov 2012
18:11 GMT
ICE REGIME

MODIS image for 21.01.2006 demonstrating ice coverage for parts of the Sivash with different salinity

t = -19°C
## ICE REGIME

<table>
<thead>
<tr>
<th>Year</th>
<th>Sivash</th>
<th>Sea of Azov</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First ice formation</td>
<td>First ice formation</td>
</tr>
<tr>
<td></td>
<td>Full ice melting</td>
<td>Full ice melting</td>
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<tr>
<td></td>
<td>Ice regime (days)</td>
<td>Ice regime (days)</td>
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<tr>
<td>2006</td>
<td>21.01</td>
<td>09.01</td>
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<td>25.03</td>
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<tr>
<td></td>
<td>77</td>
<td>81</td>
</tr>
</tbody>
</table>
ICE REGIME
Two hypersaline water areas

Landsat image of 02.02 2015
Sivash is a shallow-water lagoon and the main reason of level fluctuation is wind-surges processes. Southern Sivash coasts can dry out for tens of meters.

Photos: Southern Sivash, 12.04.16
COASTAL LINE TRANSFORMATION

Wind-surges processes in the Southern Sivash

12.04 2016
wind: north, north-west 3-4 m/s

22.06 2016
wind: east, north-east
COASTAL LINE TRANSFORMATION
Wind-surges processes in the Middle Sivash

Combination of two Landsat 8 OLI images of 22.05.2013 and 07.06.2013
(dates with different wind condition)

Red color - areas of dried coast
Black color – water
White color - land
In the Southern Sivash coasts biogenic sedimentation are dominated. It is represented by shells of mollusks, detritus, shell sand.
RGB composition map on the base of the two images obtained in 1987 and 2011.

Blue color corresponds to the spit position in 1987; yellow - in 2011.
Sivash is separated from the Sea of Azov by the Arabat spit. It has a length of 112 km and a width of 0.3 km in the south and up to 8 km in the north.
THE SEA OF AZOV WATER INTRUSIONS

The Sea of Azov water filtration through the Arabat spit
Satellite image of 08.08 2015

- in the thermal infrared range
- in the optical image of MODIS
- high resolution image from Google Earth

The chart of wind conditions, m/s
CONCLUSIONS

• Thermal and ice regimes of the Sivash were investigated. Small depth and high salinity are two main factors defined specific features of temperature and ice regime of the Sivash.

• RGB composition method is demonstrated coast line transformation induced by level change and erosion of the coasts.

• Detected specific spatial features (jets) on optical and thermal images may be interpreted like manifestation of the Sea of Azov water intrusion through the Arabat spit. All situation with jet manifestation followed by strong (> 10 – 15m/s) east or north-east wind. Additional in situ measurements are needed to confirm water intrusion in the detected areas.
THANK YOU FOR YOUR ATTENTION!