Spaceborne Radar Monitoring of Disaster Oil Spill in Kerch Strait in 2007

Konstantin Litovchenko
Space Research Institute RAS, Moscow, Russia
konlit@mail.ru

Andrei Ivanov
P.P. Shirshov Institute of Oceanology RAS, Moscow, Russia
ivanoff@ocean.ru

29th EARSel Symposium “Imagin[e.g] Europe”
16 June 2009, Chania, Greece
Situation in the Kerch Strait on 11 November 2007 after the tanker wreck

location of crashed ships:
1 – Volgoneft-139 (bow)
2 – Volgoneft-139 (stern)
3 – Volgoneft-123
4 – Vol’nogorsk
5 – Nakhichevan
6 – Kovel

Courtesy ITAR TASS
## Shipwrecks in the Kerch Strait on 11 November 2007

<table>
<thead>
<tr>
<th>shipwreck</th>
<th>time, UTC</th>
<th>location: latitude, longitude</th>
<th>depth, m</th>
<th>cargo</th>
<th>cargo carried/sank (released), tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volgoneft-139</td>
<td>02:45</td>
<td>45°13′01″ N, 36°31′06″ E (bow)</td>
<td>10.1</td>
<td>fuel oil</td>
<td>4,700/1,300</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45°15′06″ N, 36°30′07″ E (ster)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vol’nogorsk</td>
<td>06:25</td>
<td>45°11′05″ N, 36°31′07″ E</td>
<td>10.6</td>
<td>tech. sulphur</td>
<td>2,436/2,436</td>
</tr>
<tr>
<td>Nakhichevan</td>
<td>15:00</td>
<td>45°12′00″ N, 36°33′05″ E</td>
<td>9.5</td>
<td>tech. sulphur</td>
<td>2,365/2,365</td>
</tr>
<tr>
<td>Kovel</td>
<td>n/a</td>
<td>45°09′02″ N, 36°26′06″ E</td>
<td>9.3</td>
<td>tech. sulphur</td>
<td>2,100/2,100</td>
</tr>
</tbody>
</table>

source: RASMUSSEN et al. (2007)
The state of the tanker Volgoneft-139 after the wreck

stern:
grounded and towed off to Port Kavkaz on 15 November 2007

bow:
removed from the strait on 13 August 2008
RADARSAT-1 image of 15:34 UTC, 15 November 2007

HH-polarization
wind speed 3-4 m/s
RADARSAT-1 image of 3:45 UTC, 16 November 2007

HH-polarization
wind speed 2-3 m/s
TerraSAR-X image of 03:52 UTC 16 November 2007

VV-polarization
wind speed 2-3 m/s
ENVISAT-1 image of 19:39 UTC, 16 November 2007

VV-polarization
wind speed 5-6 m/s
Conclusions from SAR image analysis

- majority of the oil patches visible were evidently resulted from the tanker Volgoneft-139 crash
- most part of floating fuel oil on the sea surface undoubtedly exists in the film form despite of low water temperature
- the dark patches on the SAR images of 16 November should not be interpreted as low wind areas
Current field modeling

09:00 UTC 11 November 2007

9:00 UTC 16 November 2007

© State Oceanographic Institute
Modeling of oil spill drift by SPILLMOD model

11-12 November 2007

© State Oceanographic Institute
Modeling of oil spill spread by SPILLMOD model

11-15 November 2007
SPILLMOD model result superposed with RADARSAT-1 image of 03:52 UTC 16 November 2007
Conclusions

- SAR images allowed to localize the marine areas and shorelines of the Kerch Strait under risk of oil contamination
- The oil spreading directions is revealed from the series of SAR images
- The total area of the sea surface covered by oil is estimated as about 100 km²
- The most part of floating oil on the sea surface existed in the film forms despite low water temperature
- SAR images and numerical modeling show a good correspondence
- The comparison of SAR and modeling confirm the most dark areas within the spill spread band to be the film covered areas
- Combining of SAR and modeling technologies is the best method to track, monitor and investigate emergency oil spills