GRACE grant no 679266

Submission of results to peer review journals

D4.3

WP4: Combat of oil spill in coastal arctic water - effectiveness and environmental effects

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Version	Status	Date	Author	Approved by
1.0	draft	27th February 2019	Chris Petrich Janne Fritt-Rasmussen Nga P. Dang Kim Gustavson	Kim Gustavson, WP4 leader
2.0	final	28th February 2019	Chris Petrich Janne Fritt-Rasmussen Nga P. Dang Kim Gustavson	Steering group

Table of Content

Executive Summary

This deliverable describe the plan for submission of a peer reviewed paper based on results from experiments carried out under controlled conditions on land with in –situ burning of a crude oil pool on a freshwater ice block. It is planned to be submitted to the journal Cold Regions Science and Technology in May 2019. The paper is prepared by Norut Narvik and AU. The title is: Impact of the flame-ice feed-back on in-situ burns of oil on ice, and the abstract is presented.

Submission:
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Journal:
Cold Regions Science and Technology

Abstract

Impact of the flame–ice feedback on in-situ burns of oil on ice

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Oil spills in ice-covered waters pose unique challenges to remediation activities. In-situ burning is a potential remediation technique that has shown promising efficiency in earlier trials. An element of arctic in-situ burning is the feedback between the flame of a burn on oil-infiltrated sea ice and the melting ice beneath. A series of experiments was devised to quantify the impact of this mechanism on burn efficiency at the laboratory scale. Experiments were performed with a crude oil pool on a freshwater ice block. The pools were ignited and the development of the flame, ice temperatures, and ablation rates was monitored. All burns ended in a vigorous burn phase (boil-over). The burn efficiency was lower than expected during confined burns. A pond spread model can explain the observations and can be used to derive burn rates of a spreading pond. The reduced burn efficiencies were found to result from significant increase of the pond area during the burn in combination with relatively thin initial oil pools. The freeboard of the pools was found to play an important role. The implications for expected burn efficiency on an oil-infested sea ice surface layer are discussed.