

Fiche analytique – Mémoire de Master MUSE

A rendre au secrétariat lors de l'inscription à la soutenance du mémoire

* champs obligatoires

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TITRE MEMOIRE*	Carbon dioxide, methane emissions and climate change in the Arctic			
NUMERO MEMOIRE	445			
DATE SOUTENANCE	27.08.2021	Salle: CV002	Heure: 10h30	
THEMATIQUE* (AFFILIATION)	Carbon dioxide, methane emissions and climate change in the Arctic			
VOLEE MUSE*	Climatic Impacts			
TITRE ACADEMIQUE* (par ex.: licencié en biologie)	Joint Honors Bachelor of Science in Sustainable Development and Geography			
DIRECTION* / EVALUATION	Directeur de mémoire* Prof. Daniel Frank McGinnis	Co-directeur de mémoire*	Nom(s) du ou des juré(s)* Dr. Mina Bizic Dr. Daphné Donis Prof. Makane Moïse Mbengue	
STAGE (éventuel)	Organisme d'accueil		Maître de stage	
Projet de l'ISE (éventuel) auquel le mémoire est rattaché				
Bourse (éventuelle) reçue par l'étudiant	Excellence Master's Fellowship			
COLLATION*	Nb de pages* 108	Nb de figures* 69	Nb de tableaux* 7	
TERRAIN D'ETUDE OU D'APPLICATION	Arctic			
MOTS-CLES* (entre 5 et 10)	Greenhouse gases ; gas fluxes ; climate change ; polar amplification ; Arctic warming			
RESUME* (max 1500 car)				
SUMMARY* (en anglais)	<p>The Arctic has been undergoing a rapid warming caused by increased greenhouse gases (GHGs) concentrations. Overall, the Arctic Ocean is considered an important net sink of CO₂ and net source of CH₄. However, climate change is expected to bring a significant impact on the gas fluxes. This thesis aims to quantify the carbon dioxide (CO₂) and methane (CH₄) fluxes in the Barents, Iceland, Greenland, North, and Norwegian Seas on the research vessel Professor Molchanov (from 22 June to 11 July 2019) and on the sailboat Mauritius (from 9 June to 5 September 2020). The research firstly focused on mapping the oceanographic currents based on temperature and salinity profiles. Subsequently CO₂ and CH₄ sources and sinks were quantified to identify particularly interesting and/or previously unknown emissions hotspots. Finally, both data sets were compared to observe the potential changes in the Barents Sea. Moreover, the on-site temperature and salinity data were compared with satellite data to emphasize the importance of in-situ research. Atmospheric</p>			

	<p>GHGs data were collected by a greenhouse gas analyzer (Los Gatos Research) installed onboard. Surface water (32 samples in 2019 and 101 samples in 2020) were collected for dissolved gas analysis. This study addresses an important research gap, as many of Arctic regions do not have any flux or GHGs data. Particularly in situ research is missing, and the vessels allowed to reach difficult areas (near the shore; bays). The results confirmed a general trend that 3 identified cold currents are associated with lower CO₂ and CH₄ flux to the atmosphere and 6 warm currents flowing in the studied region favor higher fluxes. The 2019 results show that the studied region is strongly heterogenous in terms of CO₂ fluxes, with an average outflux of 25 g C m⁻² yr⁻¹. Most of the stations act as CH₄ source, with the average CH₄ emissions being equal to 0.92 g C m⁻² yr⁻¹. The average CO₂ flux from all 101 points collected in 2020 confirms the area to overall act as a sink of CO₂ with an average influx of -33 g C m⁻² yr⁻¹ and a source of CH₄, with mean emissions equal to 0.11 g C m⁻² yr⁻¹. The results emphasize that some of the areas that were previously sinks of GHGs, in the next years can become sources, which will further exacerbate the Arctic warming. The thesis draws attention to the potential consequences of the GHGs fluxes, showing that high emissions are already impacting on the sea level rise, permafrost melting, extreme weather events, and on the local fauna, flora, and indigenous population. Finally, the thesis links the scientific findings with political instability of the Arctic. It shows that high GHGs emissions, which cause increased accessibility of the region due to sea-ice melting, combined with the depletion of natural resources elsewhere, put the fragile polar environment in danger of overexploitation by interested states.</p>
REMARQUES	