

ARCTIC Expedition 2021

Cruise Report Project

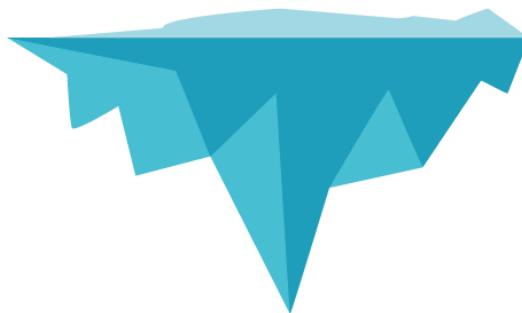
*AdvanCing knowledge on the present Arctic Ocean by
chemical-physIcal, biogeochemical and biological
obServAtIoNs to preDict the futuRe chAnges*

- CASSANDRA -

29/08/2021, Longyearbyen (NO) – 14/09/2021, Bergen (NO)

PRA

PROGRAMMA DI RICERCHE IN ARTICO



2021

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1- SUMMARY

CASSANDRA project sought to quantify the current state of the physical, chemical, biological and biogeochemical systems of a sub-Arctic historic transect at 75°N (from 75°N 16°E to 75°N 13°W) crossing the Greenland Sea Gyre. As part of the Synoptic Arctic Survey 2020/22 (SAS; <https://synopticarcticsurvey.w.uib.no/>), CASSANDRA cruise operated with a multidisciplinary approach, making use of common protocols. Emphasis of the CASSANDRA project will be devoted to understanding the major ongoing transformations on the water masses, the marine ecosystem and the carbon cycle.

2- PARTICIPANTS LIST

CASSANDRA cruise started from Longyearbyen on 29 August and ended at Bergen on 14 September 2021 and several scientists were involved (Table 1).

Table 1: CASSANDRA cruise: Participants, Affiliation and Field Activities.

CASSANDRA CRUISE (29/8-14/9/2021)		
Participants	Affiliation	Field Activities
Facchin Lorenzo	OGS	On board Technologist - Cruise Leader
Coslovich Francesco	OGS	On board Technologist
Cova Andrea	OGS	On board Technologist
Pasotti Jacopo	OGS	Press
Azzaro Maurizio	CNR ISP	Microbial respiration, POC, DOC - Principal Investigator
Bensi Manuel	OGS	Physical Oceanography
Borme Diego	OGS	Zooplankton and Iponeuston (Abundance and diversity)
Cairns Warren R.L.	CNR ISP	Contaminants, $\delta^{18}\text{O}$ and δD of H_2O
Diociaiuti Tommaso	OGS	Phytoplankton and Microzooplankton (Abundance and diversity)
Feltracco Matteo	CNR ISP	Contaminants, emerging pollutants, Bioaerosol, $\delta^{18}\text{O}$ and δD of H_2O
Giordano Patrizia	CNR ISP	Physical Oceanography
Langone Leonardo	CNR ISP	Physical Oceanography
Mansutti Paolo	OGS	Physical Oceanography
Kovacevic Vedrana	OGS	Physical Oceanography
Monti Marina	OGS	Microzooplankton abundance and diversity
Papale Maria	CNR ISP	Microbial Diversity (Seawater, Bioaerosol and sediment), Biolog, Cultivable bacteria
Rappazzo Alessandro C.	UniVe; CNR ISP	Viral abundance, Microbial abundance (DAPI, Live/Dead, CTC, LPS) and biomass, Chla, Enzymatic activities, Biolog, Cultivable bacteria
Rizzo Carmen	SZN; CNR ISP	Microbial Diversity (Seawater, Bioaerosol and sediment), Biolog
Relitti Federica	OGS	O_2 , nitrite and nitrate, phosphate, silicate, total dissolved nitrogen and phosphorous, $\delta^{13}\text{C-DIC}$, spectrophotometric pH _T and total alkalinity
Urbini Lidia	OGS	O_2 , nitrite and nitrate, phosphate, silicate, total dissolved nitrogen and phosphorous, $\delta^{13}\text{C-DIC}$, spectrophotometric pH _T and total alkalinity

3- PARTICIPATING INSTITUTIONS

CNR - National Research Council, Institute of Polar Sciences, Messina/Bologna/Venice (Italy);
 OGS - National Institute of Oceanography and Applied Geophysics, Trieste (Italy);
 SZN, ‘Anton Dohrn’ Zoological Station, Messina (Italy);
 UniVe - Ca’ Foscari University of Venice (Italy).

4- CASSANDRA CRUISE OBJECTIVES

CASSANDRA overarching goal is to contribute to the evaluation of the current state and major ongoing transformations of the Arctic marine system along one of the main gates to the Arctic Ocean. To achieve this scope CASSANDRA pursued 3 key foci: A) Physical and biogeochemical state and variability; B) Microbial Ecosystem response; C) Carbon cycle and Ocean Acidification. The aims of the focal areas are: A1) Depict the distribution and the dynamics of the main water masses in the area of the GSG, and investigate the effects of processes that determine, at different spatial and temporal scales, atmospheric and oceanic circulation patterns; A2) Characterise the water masses biogeochemistry; B1) Evaluate the plankton diversity, abundances, and population structures living in the Greenland Sea Gyre and the northward range expansion of non-indigenous species; B2) Estimate the biomass flux in the analysed ecosystems; C1) Determine the exchanges inorganic carbon along the 75°N transect; C2) Quantify the input and fate of organic carbon; C3) Assess the levels of acidification and possible impacts on the marine biota.

5- DESCRIPTION OF ACTIVITY

During the cruise 28 CTD casts were performed in twenty stations (Fig.1). The station identifications, coordinates and bottom depths are reported in Table 2. Seawater samples were collected by a Rosette sampler equipped with 24 Niskin bottles (capacity 10 L). In addition, meteo parameters (wind speed, wind direction, air temperature, net atmospheric radiation, relative humidity, air pressure) were recorded during the navigation through a shipboard meteorological station and these data have been coupled with some Bioaerosol measurements (diversity and function) in some stations. Ocean current data (velocity and direction) have been collected through a vessel mounted Acoustic Doppler Current Profilers (ADCPs) working at 38 KHz.

In twelve sampling stations (Fig. 1, blue rhombus and red squares; Table 3a) seawater samples were collected for marine chemistry, biogeochemistry parameters (dissolved oxygen, nitrite and nitrate, phosphate, silicate, total dissolved nitrogen and phosphorous, $\delta^{13}\text{C}$ -DIC, spectrophotometric pH_T and total alkalinity, Particulate and Dissolved Organic Carbon and N, $\delta^{18}\text{O}$ and δD of H₂O) and pollutants. Water samples to carry out salinity measurements with the Autosal Salinometer (model Guildline8400B) for data quality control of the CTD probe were collected in 7 stations, in some cases at multiple levels. At station 30, interstitial water was also collected to measure salinity in the sediment sample from multicorer.

Samples for biological parameters were collected in 6 main stations (Fig. 1, red squares; Table 3b) and have been partially processed to obtain the following measurements along the water column: Viral component (Cytometry); Prokaryotic (Bacteria and Archaea) abundance (also including Live/Dead; cultivable bacteria), biomass (Cytometry, Epifluorescence Microscopy), activity (respiring cells CTC+; Metabolic profiles - Biolog), phylogenetic composition and metabolic potential by next generation sequencing approach; Phytoplankton: Size fractionated chlorophyll (spectrofluorimetric analysis), taxa community composition by microscopy and molecular analysis, optical detection (fluorimeter); Activity in planktonic communities: Microbial community respiration (ETS assay), Enzymatic activities (leucine aminopeptidase, beta-glucosidase and alkaline phosphatase; Fluorimetric assays); Microzooplankton: abundance, biomass, taxa community composition by microscopy, subsamples for molecular analysis. Sampling with WP2 Net were done at the six main stations (Fig. 1, red squares; Table 3b) for Meso- and Macro-zooplankton. Iponeuston

sampling was carried out via manta net. On board samples obtained by plankton nets were split to estimate the biomass and to describe the taxa composition of the zooplanktonic community. Subsamples for biomass estimations were fractioned (fractions: > 2000 µm, 2000-1000 µm, 1000-500 µm, and 500-200 µm) and frozen on board. Subsamples for qualitative and quantitative analysis have been preserved both in a seawater-buffered formaldehyde solution (4% final concentration) and in ethanol. Additional water and sediment samples (not foreseen in the original plan) were collected by multi-corer at stations Cass-010 and Cass-030 and will be processed for the analysis of microbial communities.

Unfortunately, the CASSANDRA project program was not fully implemented. In fact, 46 hydrological stations were planned and about half of the stations envisaged biogeochemical measurements. The biological stations alone were made 100% with however a lack of some sampling depths along the vertical. The modification of the original plan was caused both by bad weather conditions and by technical problems with the hydrological cable.

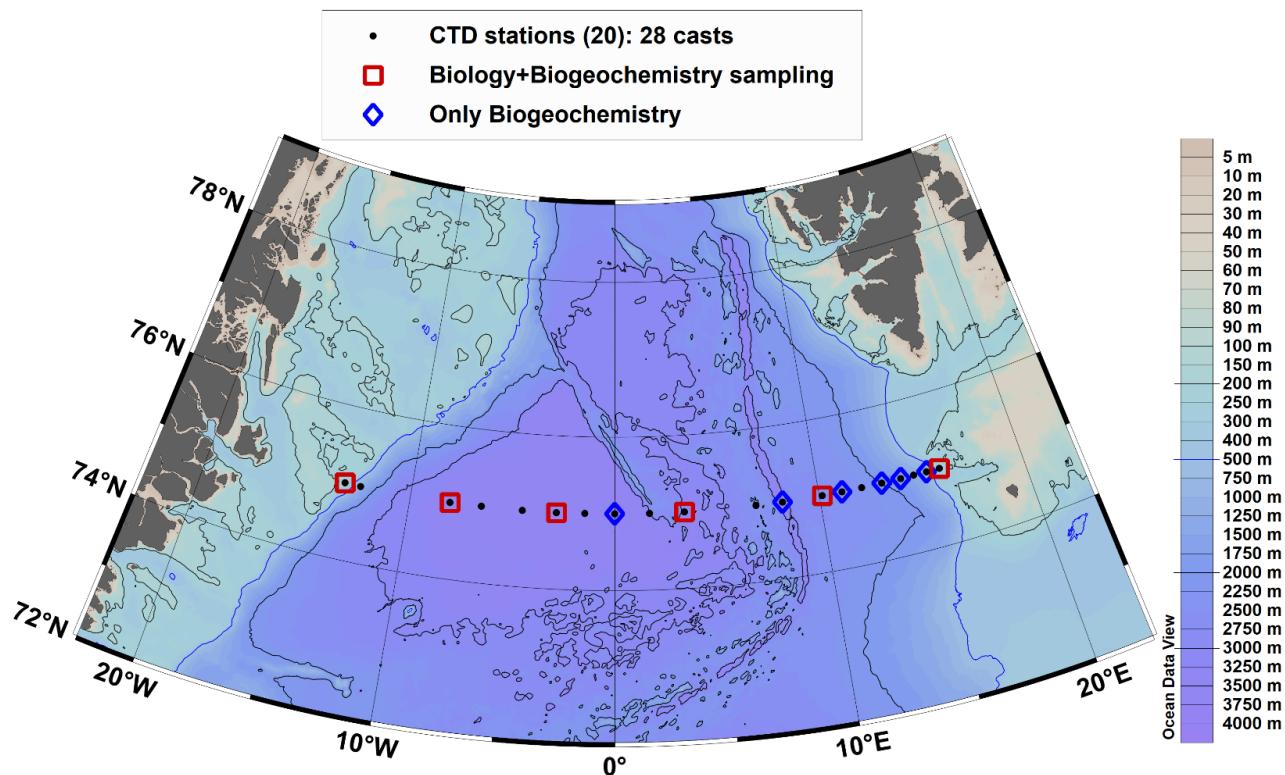


Figure 1 – Study area and sampling stations occupied during the CASSANDRA cruise. Black dots, red squares and blue rhombus indicate the hydrological stations (CTD), biological + biogeochemistry stations, and the biogeochemistry stations, respectively.

Table 2: Station identifications, coordinates and bottom depths revealed by echosounder.

Station	Date	Longitude	Latitude	Bottom Depth [m]
Cass-001	02-09-2022	16.00083°E	75.00034°N	~ 244
Cass-002	02-09-2022	15.35067°E	75.00034°N	~ 863
Cass-003	02-09-2022	14.70067°E	75.00034°N	~ 1286
Cass-004	03-09-2022	14.05050°E	75.00050°N	~ 1684
Cass-006	03-09-2022	13.10883°E	75.00034°N	~ 2007
Cass-007	03-09-2022	12.09917°E	75.00034°N	~ 2233
Cass-008	03-09-2022	11.12950°E	75.00000°N	~ 2436
Cass-010	04-09-2022	10.15017°E	75.00017°N	~ 2495
Cass-013	04-09-2022	8.19967°E	74.99966°N	~ 3445
Cass-015	05-09-2022	6.89817°E	74.99983°N	~ 1920
Cass-020	06-09-2022	3.40083°E	74.99983°N	~ 3495
Cass-023	06-09-2022	1.70117°E	74.99966°N	~ 2916
Cass-025	06-09-2022	0.00183°E	74.99983°N	~ 3707
Cass-028	07-09-2022	1.44934°W	74.99966°N	~ 3614
Cass-030	07-09-2022	2.84283°W	74.99850°N	~ 3642
Cass-032	09-09-2022	4.49750°W	74.99966°N	~ 3531
Cass-035	09-09-2022	6.49734°W	74.99966°N	~ 3413
Cass-038	09-09-2022	8.04651°W	74.99983°N	~ 3341
Cass-045	09-09-2022	12.45667°W	74.99767°N	~ 1059
Cass-046	10-09-2022	13.22968°W	74.99750°N	~ 220

6- DATA ACQUISITION AND SAMPLE ANALYSIS/DATA STORAGE/AVAILABILITY

Acquired measurements and analysis results will be stored with proper file format. QA/QC (Quality Assurance/Quality Control) procedures will be applied to data from automatic instrumentation. Currently the analysis of the samples is very late due to the administrative delays for the stipulation of the ISP contract with the Arctic Research Program (PRA) and the subsequent passage of the economic resources from ISP to OGS. All datasets will be documented through metadata compliant 19115 standard, and stored in the CNR (<http://iadc.cnr.it/cnr/>) and OGS (<https://nodi.inogs.it/>) data centers, which are First Level Nodes of the Italian Arctic Data Center (IADC) funded by Arctic Research Programme (PRA). IADC and its CNR and OGS nodes will provide IT platforms and software (as GeoNetwork and OpenDAP) to assure discovery and access to data by any user following FAIR principles. In particular, thanks to OpenDAP will be possible to distribute csv files in the netCDF format. IADC will offer tools also for integration and deep analysis of acquired datasets.

Table 3a: Chemical and biogeochemical parameters (Bibliographic references for the oceanographic measurements reported in paragraph 7).

Station	Depth	O2	NO2 NO3	PO4	SiO4	TDN	TDP	$\delta^{13}\text{C-DIC}$	$\delta^{18}\text{O}$ $\delta\text{D of H}_2\text{O}$	pHT	Total Alkalinity	POC PON	DOC	Hg	Pesticides	Emergent Pollutants
CASS-001	sup	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	20	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	40	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	100	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	200	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	240	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
CASS-002	sup	x	x	x	x	x	x	x	x	x	x					
	20	x	x	x	x	x	x	x	x	x	x	x				
	40	x	x	x	x	x	x	x	x	x	x	x				
	100	x	x	x	x	x	x	x	x	x	x	x				
	200	x	x	x	x	x	x	x	x	x	x	x				
	500	x	x	x	x	x	x	x	x	x	x	x				
	870	x	x	x	x	x	x	x	x	x	x	x				
CASS-004	sup	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	20	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	40	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	100	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	200	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	500	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	1000	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	1500	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	1680	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
CASS-006	sup	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	20	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	40	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	100	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	200	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	500	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	1000	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	1500	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	1999	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
CASS-008	sup	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	20	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	40	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	100	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	200	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	500	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	1000	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	1500	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	2000	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
CASS-010	2426	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	sup	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	20	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	40	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	100	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	200	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	500	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	1000	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	1500	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
CASS-010	2000	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	2520	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	2528	x	x	x	x			x		x	x	x				

Station	Depth	O2	NO2 NO3	PO4	SiO4	TDN	TDP	$\delta^{13}\text{C-DIC}$	$\delta^{18}\text{O}$ $\delta\text{D of H}_2\text{O}$	pHT	Total Alkalinity	POC PON	DOC	Hg	Pesticides	Emergent Pollutants
CASS-013	sup	x	x	x	x	x	x	x	x	x	x					
	20	x	x	x	x	x	x	x	x	x	x					
	40	x	x	x	x	x	x	x	x	x	x					
	100	x	x	x	x	x	x	x	x	x	x					
	200	x	x	x	x	x	x	x	x	x	x					
	500	x	x	x	x	x	x	x	x	x	x					
	1000	x	x	x	x	x	x	x	x	x	x					
	1500	x	x	x	x	x	x	x	x	x	x					
	2000	x	x	x	x	x	x	x	x	x	x					
	2500	x	x	x	x	x	x	x	x	x	x					
	3000															
	3445	x	x	x	x	x	x	x	x	x	x					
	sup	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
CASS-020	20	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	40	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	100	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	200	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	500	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	1000	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	1500	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	2000	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	2500	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	3000	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	3500	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	sup	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
CASS-025	20	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	40	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	100	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	200	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	500	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	1000	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	1500	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	2000	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	2500											x	x			
	3000	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	3500	x	x	x	x	x	x	x	x	x	x					
	3698	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	sup	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
CASS-030	20	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	40	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	100	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	1000	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	1500	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	2000	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	2500											x	x			
	3642	x	x	x	x	x	x	x	x	x	x					
CASS-038	sup	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	20	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	40	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	100	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	200	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
CASS-046	sup	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	20	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	40	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	100	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	220	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Table 3b: Biological parameters (Bibliographic references for the oceanographic measurements reported in paragraph 7).

Station	Depth	Dapi	CTC	Live / Dead	LPS	Biolog	Virus	Prok	Prok DNA	Chla	Respiratory activity	Total Enzymatic Activity	Dissolved Phytoplankton	DNA Phytoplankton	Microzooplankton	DNA Microzooplankton	Meso-, Macrozooplankton	WP2 net Manta Net	Iphoneuston
CASS-001	sup	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0-20 m	0-100 m	sup
	20	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
	40	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
	100	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
	200	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
	240	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	sup	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0-20 m	0-100 m	sup
	20	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	40	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	100	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	200	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	500	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	1000	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	1500	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	2000	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	2500	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	2528	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	sup	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0-30 m	0-100 m	sup
	20	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	40	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	100	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	200	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
CASS-020	sup	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	1000	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	1500	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	2000	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	2500	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	3000	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	3500	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	sup	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0-30 m	0-100 m	sup
	20	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	40	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	100	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
CASS-030	1000	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	1500	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	2000	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	2500	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	3642	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	sup	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0-30 m	0-100 m	sup
	20	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
CASS-038	40	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	100	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	200	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	sup	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	0-30 m	0-100 m	sup
	40	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
CASS-046	100	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	200	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
	220	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	

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