



60 Years

IAEA

Atoms for Peace and Development

Overview of a marine radioactivity database and data management

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MARiS – Marine Information System

- This presentation is orientated towards the IAEA's open access database of marine radionuclides (MARiS): maris.iaea.org

The screenshot displays the MARiS web interface. At the top, the title "MARiS - Marine Information System" is visible alongside the IAEA logo and the text "IAEA International Atomic Energy Agency". A navigation menu includes "Home", "Search", "Links", "Help", and "About". The user is identified as "User: Anonymous".

The main search area is titled "Search" and contains several filter sections:

- Search By Region** (selected) and **Search Using Map** (disabled).
- Region:** A dropdown menu set to "All Regions".
- Subregion:** A dropdown menu set to "<All>".
- A blue instruction: "Select a Region and/or Subregion to show samples on the map."
- Data Provider:** A dropdown menu set to "<All>".
- Sample Type:** A dropdown menu set to "Water".
- Tracer:** A dropdown menu set to "<Select One>".
- A blue instruction: "Select a Tracer to enable the Search button."
- Depth:** Two input fields for "From" and "to".
- Year:** Two dropdown menus for "From" and "to".

At the bottom left, there is a "Select Fields" link and a "Search" button. Below the button, it states "118141 measurements found.".

The right side of the interface features a world map with a color-coded bathymetry background. Numerous green diamond-shaped markers are scattered across the map, representing the locations of marine radionuclide measurements. Above the map, there are interactive icons: "Reset Co-ordinates", "Zoom In", "Zoom Out", "Identify Sample", and a hand icon.

Presentation objectives

- To define database jargon:
 - data vs. datum
 - data and metadata
 - fields and records
 - datasets and databases
- To shed some light on databases and take you behind the scenes
- To distil data management to its component parts
- To demonstrate why we should care about archiving data?

Database talk outline

- Part 1 – What is data and why is metadata so important?
- Part 2 – From datasets to databases
- Part 3 – The MARiS database and data network

What is/are datum/data?

- Singular **datum** vs. plural **data**
 - Traditionally **data** is the plural of the singular **datum**
 - However, **data** is now commonly accepted as the singular and plural version of the noun
 - The internet is full of linguistic discussions about the word datum and data
 - The best approach is to be consistent in your own usage use the words **data** and **datum**

So, what is data?

- Is it:
 - Measurement?
 - Information?
 - Pattern?
 - Knowledge?



Increasing number
of data points

What is data?

- A single data point is a measurement of a parameter, for example:
 - The temperature of seawater: 20 °C
 - The length of a fish: 30 cm
 - The salinity of seawater: 35
 - The concentration of oxygen: 220 $\mu\text{mol L}^{-1}$
 - The mass of sediment: 3 kg
 - The activity of a radionuclide: 2 Bq m^{-3}

What is metadata?



British Oceanographic
Data Centre
NATURAL ENVIRONMENT RESEARCH COUNCIL

In data processing, metadata is definitional data that provides information about or documentation of other data managed within an application or environment.



Biological & Chemical Oceanography Data Management Office

The information contained in the metadata should be sufficient to allow another researcher to make use of your data, and, in a sense, to be able to recreate it

- So what does this mean in simple terms?

What is metadata?

- **Metadata is a description of the data**
- 20 °C – Data (measurement)
- Where was it measured? depth, lat, long
- When was it measured? Date and time
- How was it measured? Hg in glass, sensor
- Who measured it? Name, lab, contact info
- Citations to methods, standards used, ancillary measurements, general notes, cruise & station ID, etc.....

What is metadata?

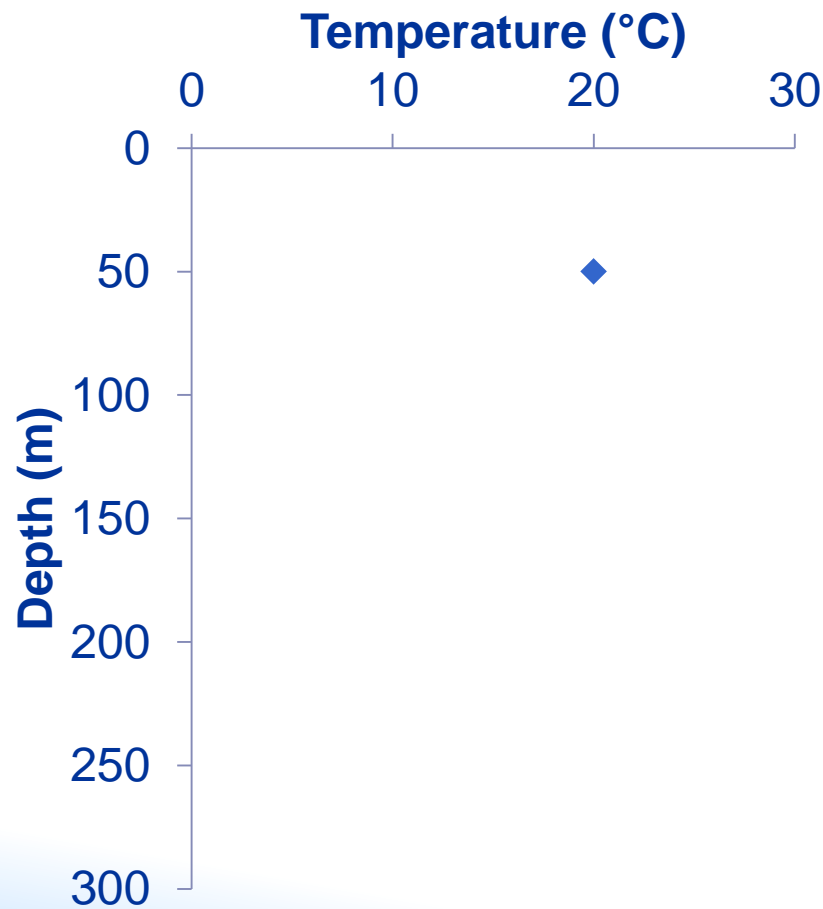
- Metadata informs you about the data to create **context**
- **Without metadata**, the data is of no value because **there is no context**
 - Data originator - traceability
 - Depth
 - Position
 - Date
 - Method
 -

Data in the context of metadata



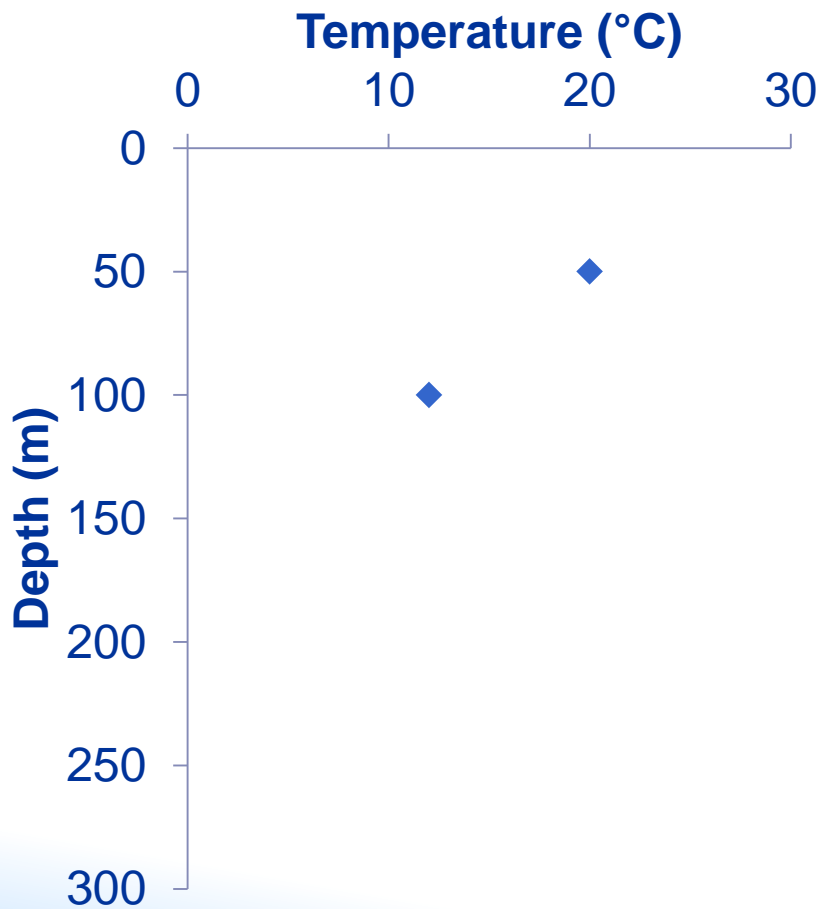
- A measurement is made: temperature is 20 °C
- So we have one data point of temperature
- **Measurement** without context

Data in the context of metadata



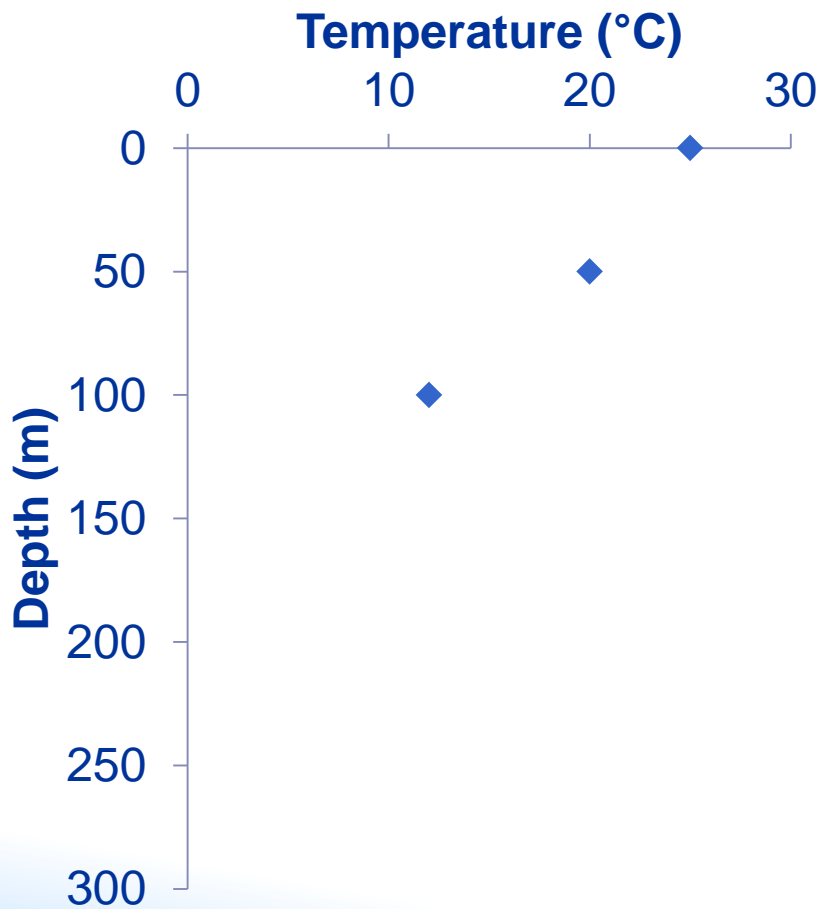
- The measurement depth is 50 m
- Metadata gives context
- The temperature at 50 m is 20 °C
- **Information** requires context (metadata)

Data in the context of metadata



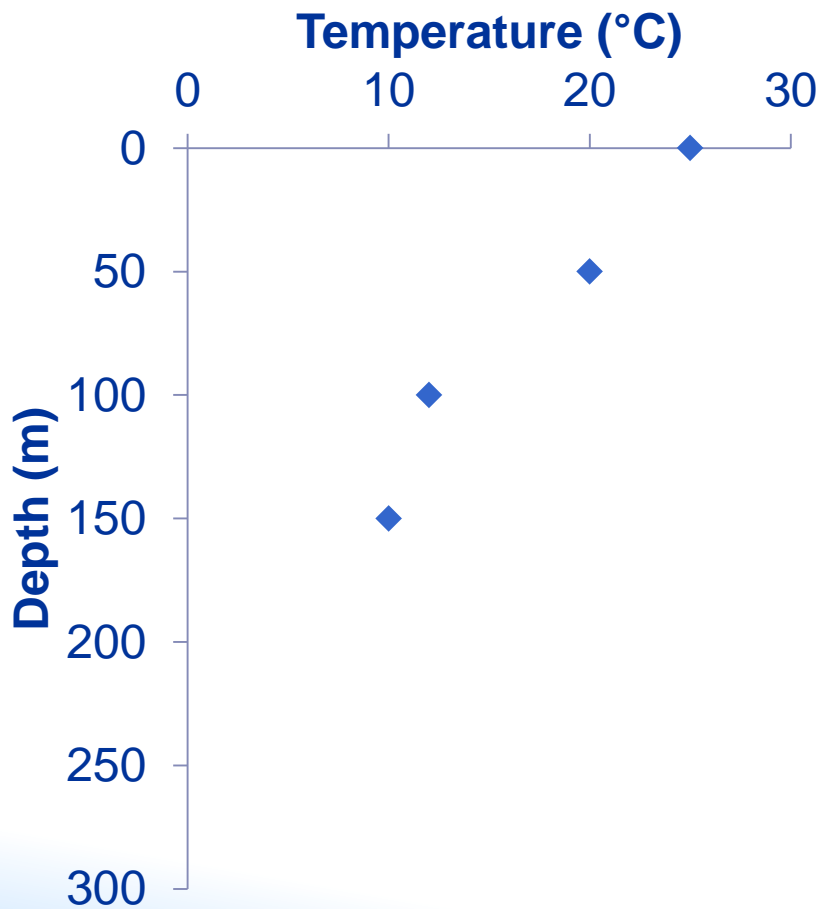
- Add more data in the context of depth to create more information

Data in the context of metadata



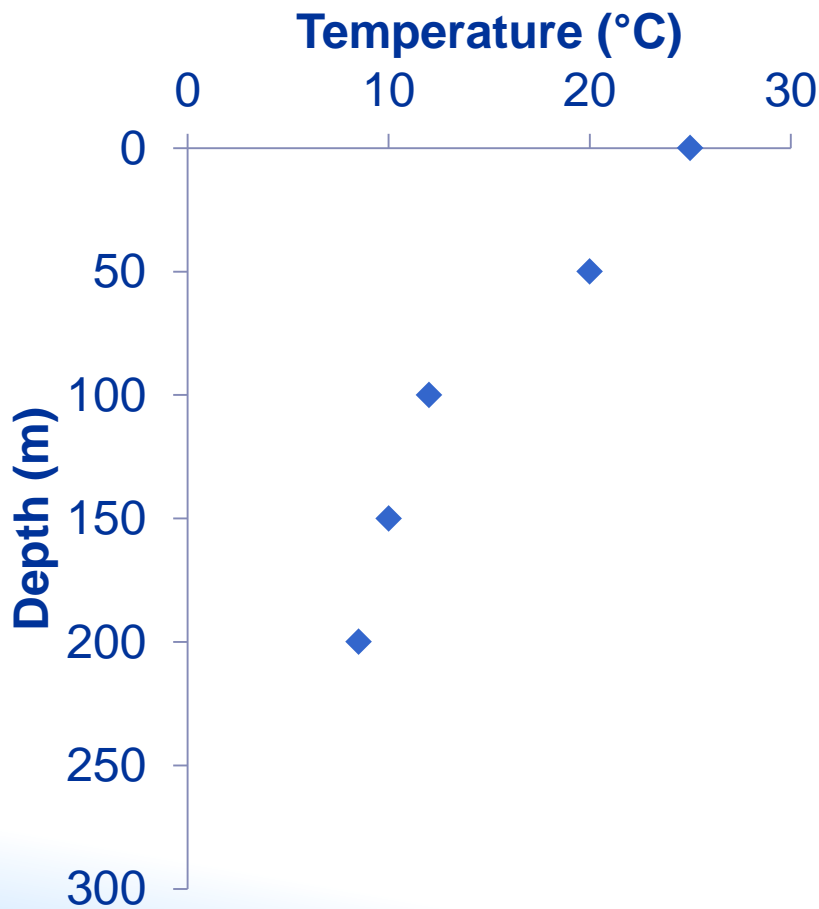
- Add more data in the context of depth to create more information

Data in the context of metadata



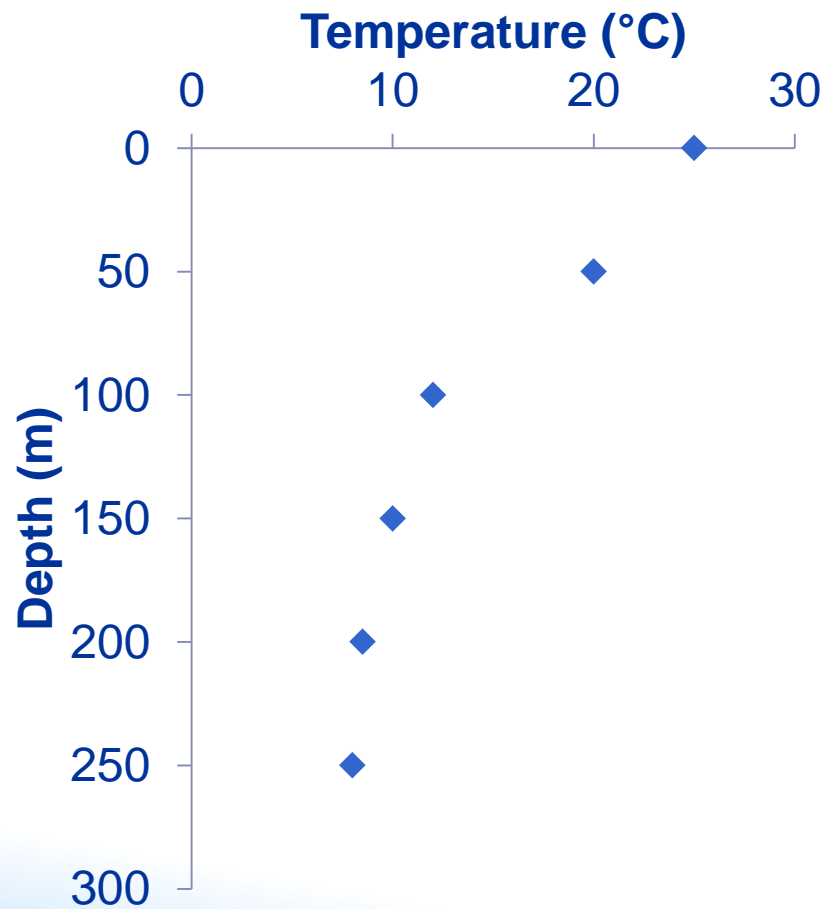
- Add more data in the context of depth to create more information
- **Patterns** emerge as more data is added

Data in the context of metadata



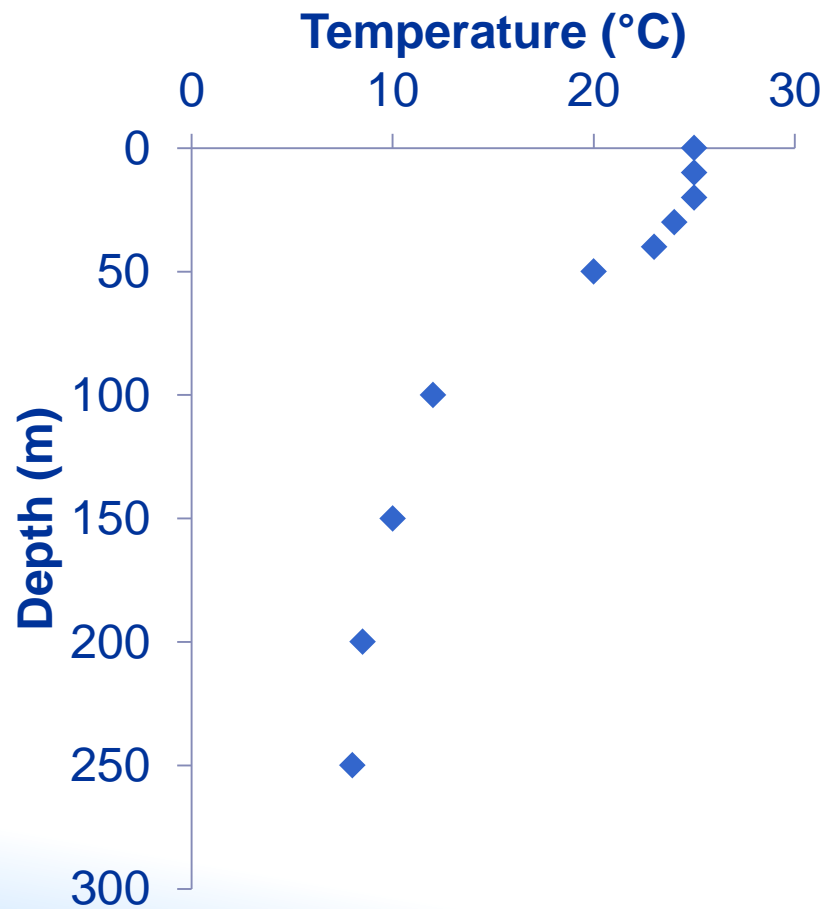
- Add more data in the context of depth to create more information
- **Patterns** emerge as more data is added

Data in the context of metadata



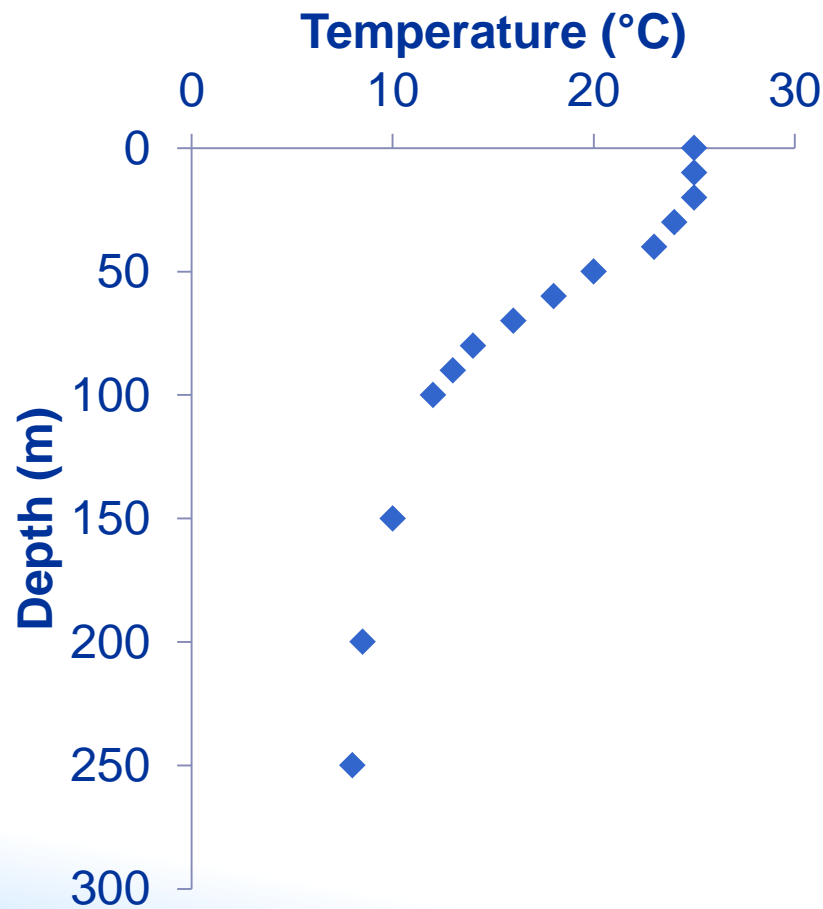
- As the resolution of the data increases, the pattern becomes more detailed

Data in the context of metadata



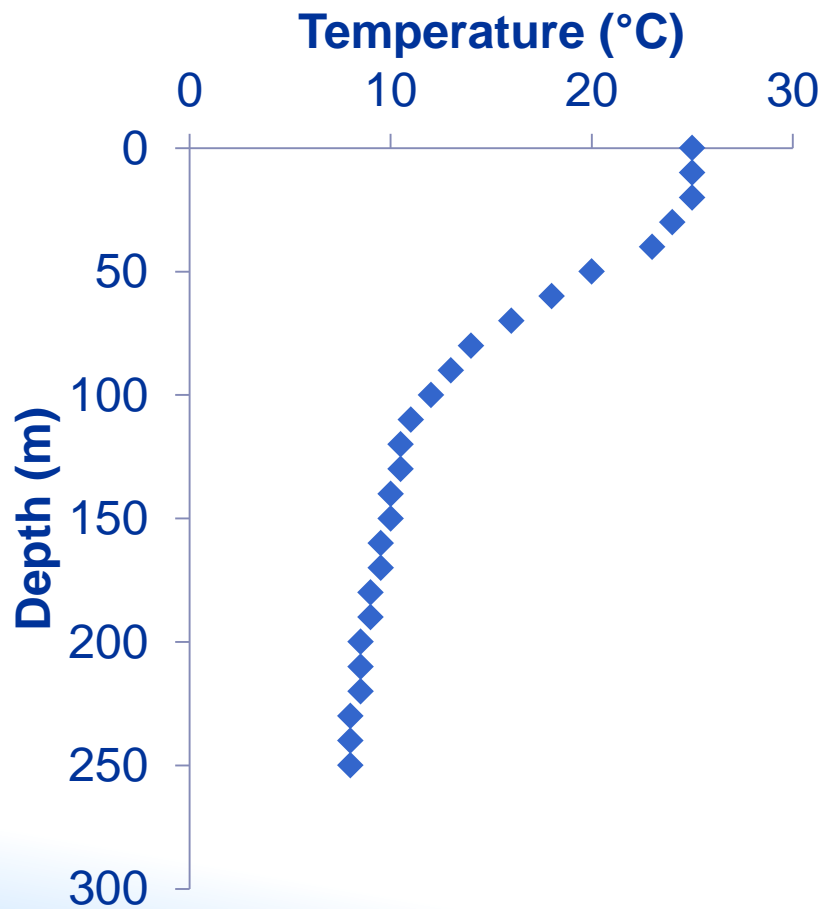
- As the resolution of the data increases, the pattern becomes more detailed

Data in the context of metadata



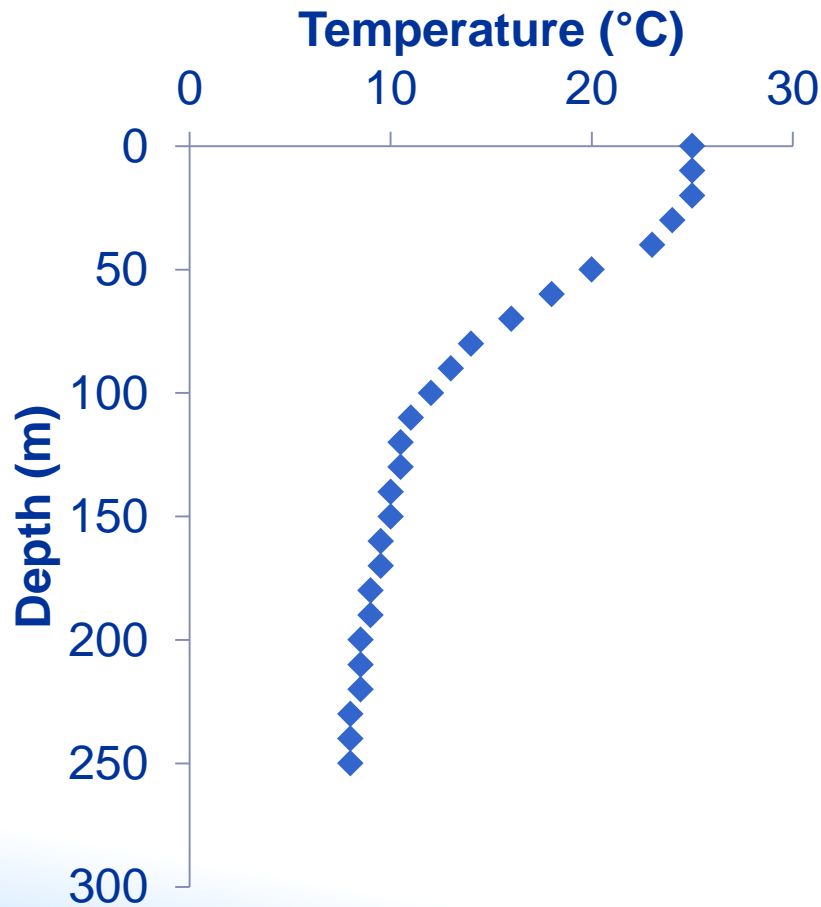
- As the resolution of the data increases, the pattern becomes more detailed

Data in the context of metadata



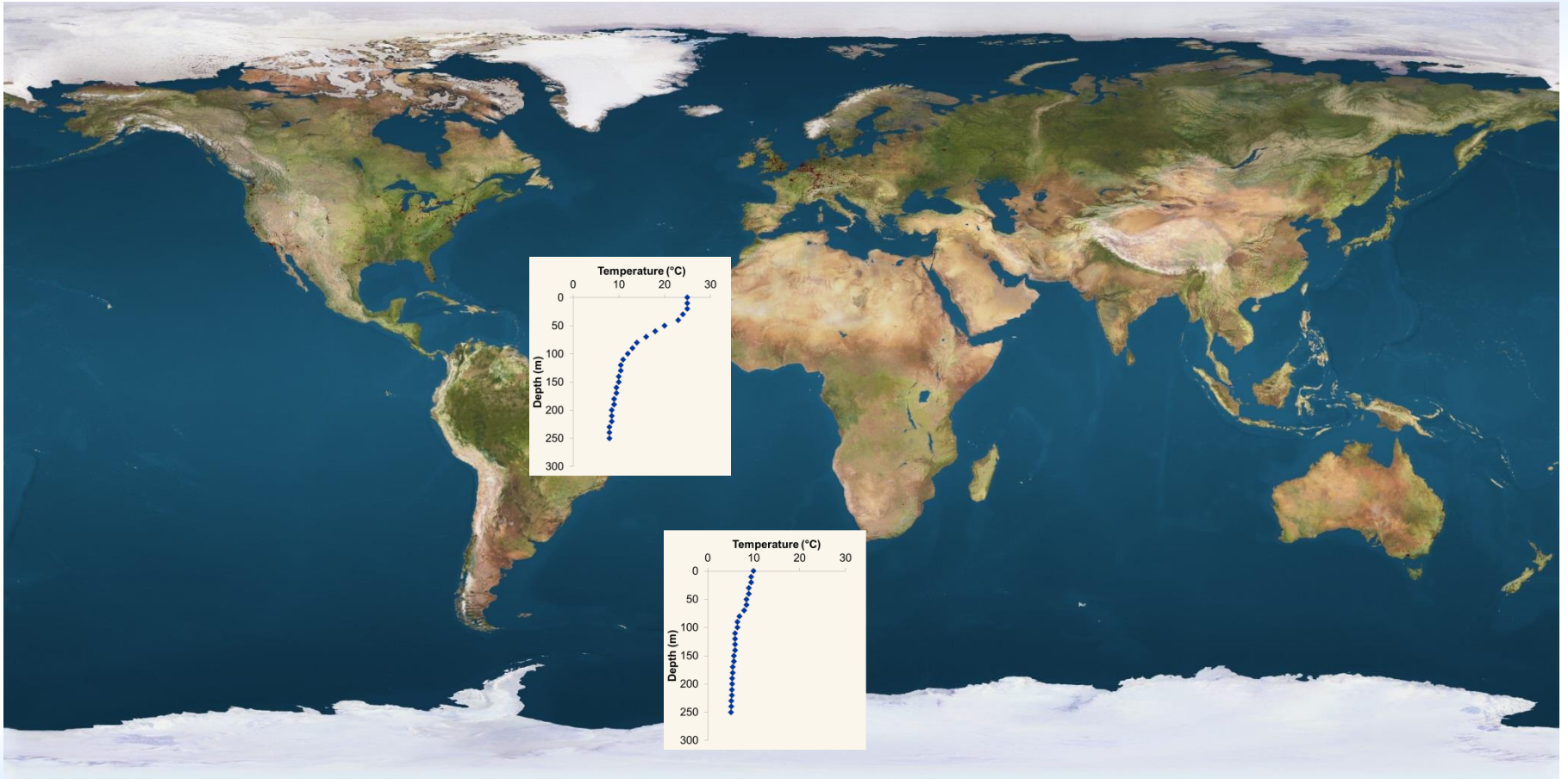
- As the resolution of the data increases, the pattern becomes more detailed
- Patterns in data provide **knowledge**
- 1 metadata parameter of depth

Data in the context of spatial metadata

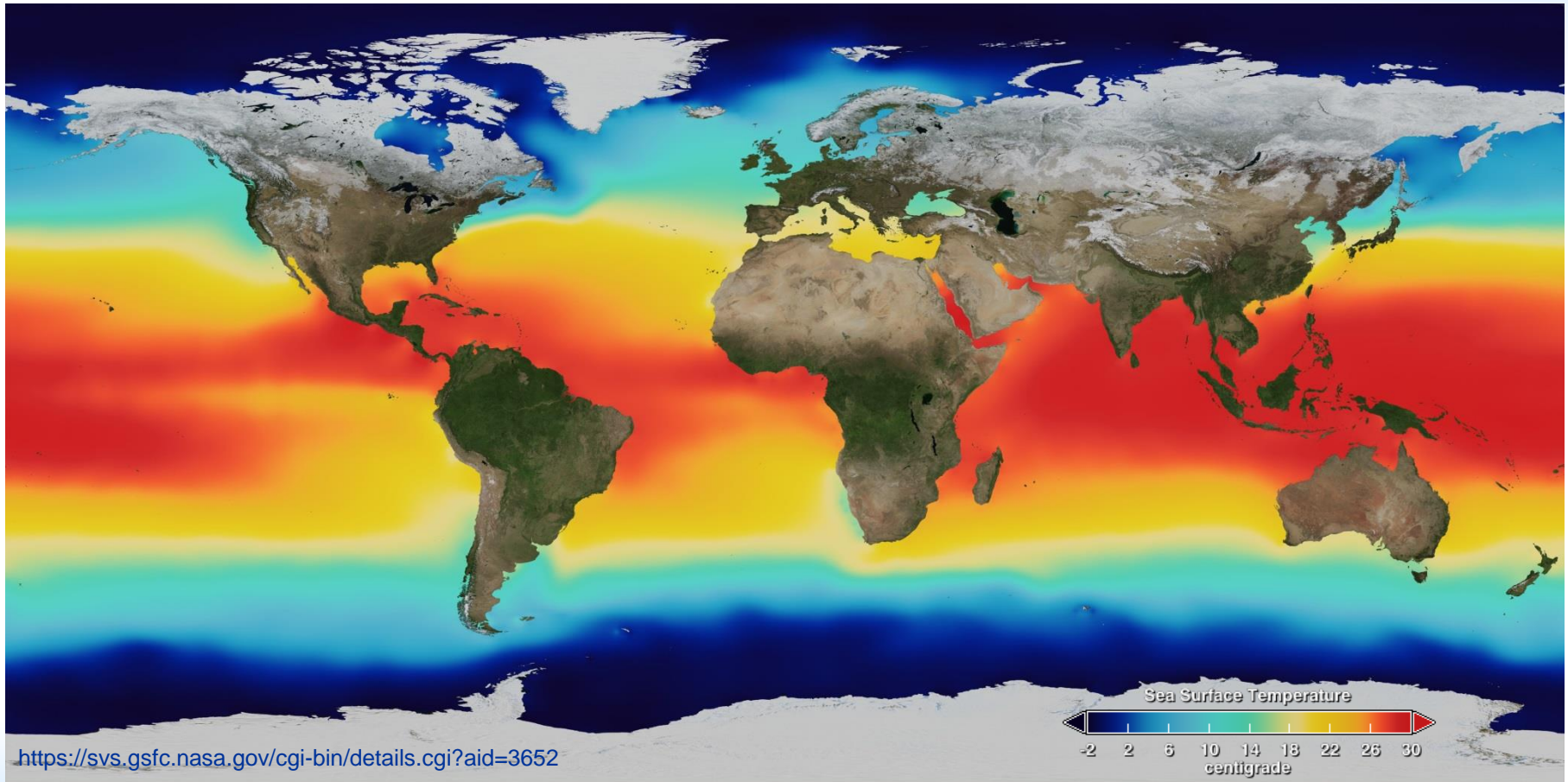


- Add spatial metadata
 - Latitude and Longitude

Data in the context of spatial metadata

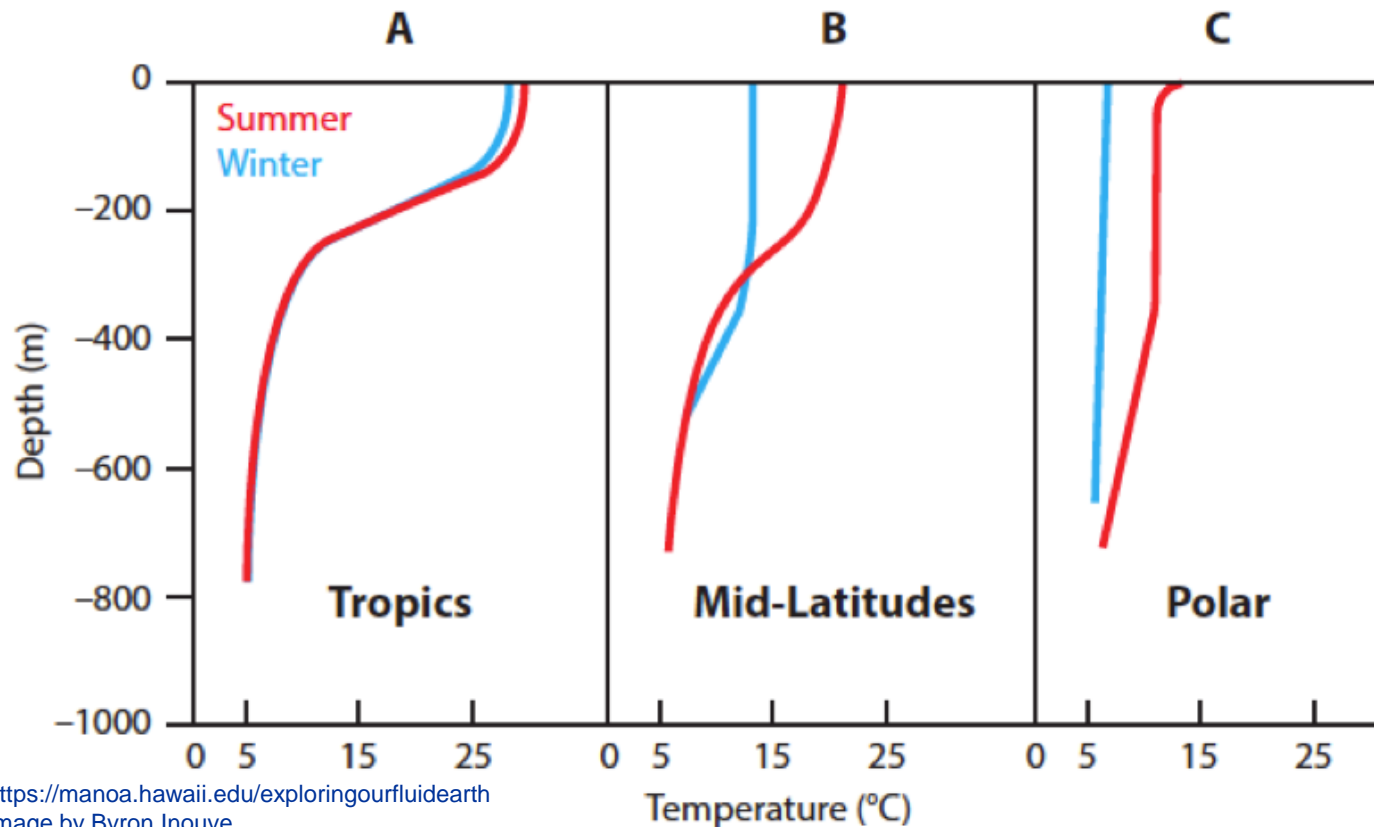


Data in the context of spatial metadata



Data in the context of temporal metadata

- Add temporal metadata: date and time



<https://manoa.hawaii.edu/exploringourfluidearth>
Image by Byron Inouye

Data and metadata

- Treat data & metadata with **equal importance**
- Submitted data often lacks basic metadata e.g.:
 - Latitude and longitude
 - Sampling depth
 - Sampling date
 - Dates are easily confused: 09/06/16
 - 9th June 2016 or September 6th 2016?
 - The best format for dates has lettered months: dd-mmm-yyyy
 - e.g. 09-Jun-2016

Metadata requirements

Seawater	Notes
Measurement \pm Uncertainty	Data \pm Uncertainty
Reference/citation	Fundamental metadata Without any one of these the data cannot be included in MARiS
Measurement type (=,<,ND)	
Unit	
Nuclide	
Date Sampled	
Latitude	
Longitude	
Sampling depth	
Laboratory	
Collection method	
Sample prep method	
Counting method	
Salinity	
Temperature	
Sample lab code	Good to have and provides further useful context for data search and interpretation
Total water depth	
Station	
Cruise	
Sample volume	
Filtered	Other ancillary metadata fields exist in MARiS but are less used
Acidified	
Other fields	

Metadata requirements

Seawater	Sediment	Biota	Suspended matter	Notes
Measurement ± Uncertainty	Measurement ± Uncertainty	Measurement ± Uncertainty	Measurement ± Uncertainty	Data ± Uncertainty
Reference/citation	Reference/citation	Reference/citation	Reference/citation	Fundamental metadata Without any one of these the data cannot be included in MARiS
Measurement type (=,<,ND)	Measurement type (=,<,ND)	Measurement type (=,<,ND)	Measurement type (=,<,ND)	
Unit	Unit	Unit	Unit	
Nuclide	Nuclide	Nuclide	Nuclide	
Date Sampled	Date Sampled	Date Sampled	Date Sampled	
Latitude	Latitude	Latitude	Latitude	
Longitude	Longitude	Longitude	Longitude	
Sampling Depth	Upper and lower slice	Species	Sampling Depth	
Laboratory	Laboratory	Body part	Laboratory	
Collection method	Collection method	Laboratory	Collection method	Highly informative metadata to include with the data
Sample prep method	Sample prep method	Collection method	Sample prep method	
Counting method	Counting method	Sample prep method	Counting method	
Salinity	Sediment type	Counting method	Sample lab code	
Temperature	Weights (wet/dry/ash)	Sampling Depth	Total water depth	Good to have and provides further useful context for data search and interpretation
Sample lab code	Sample lab code	Sample lab code	Station	
Total water depth	Total water depth	Total water depth	Cruise	
Station	Station	Station	Drying method	
Cruise	Cruise	Cruise	Organic content	
Sample volume	Drying method			
Filtered	Organic content			Other ancillary metadata fields exist in MARiS but are less used
Acidified	Oxic/Anoxic			

From a dataset to a database

Casacuberta et al. (2013) Biogeosciences, 10, 3649–3659

Station	Sample code	Collection date	Depth(m)	Longitude	Latitude	90Sr(Bq/m3)	90Sr Error	89Sr(Bq/m3)	89Sr Error
19	Sr-20	12.06.2011	200	142.9980	37.4940	0.8	0.2		
19	Sr-21	12.06.2011	100	142.9980	37.4940	1.7	0.2		
19	Sr-22	12.06.2011	50	142.9980	37.4940	4.7	0.4		
19	Sr-23	12.06.2011	20	142.9980	37.4940	8.1	0.4	25	4
20	Sr-24	13.06.2011	2	143.0016	37.6000	1.7	0.2		
21	Sr-25	13.06.2011	2	142.2947	37.3008	7.4	0.4	22	9
23	Sr-32	14.06.2011	100	142.0050	37.4810	4.8	0.7		
23	Sr-33	14.06.2011	50	142.0050	37.4810	34	2	137	43
23	Sr-34	14.06.2011	20	142.0050	37.4810	37	3	132	34
23	Sr-35	14.06.2011	10	142.0050	37.4810	28	1	65	21
24	Sr-36	14.06.2011	2	141.5984	38.0004	2.5	0.2		
25	Sr-37	15.06.2011	2	141.2673	37.3187	17	1	29	13

- Example dataset – flat single spreadsheet (Table in paper or supp. info)
- Contains all the necessary fundamental metadata
- The text of the paper contains much of the highly informative metadata
- Focus on a small number of samples

From a dataset to a database

Casacuberta et al. (2013) Biogeosciences, 10, 3649–3659

Station	Sample code	Collection date	Depth(m)	Longitude	Latitude	90Sr(Bq/m3)	90Sr Error	89Sr(Bq/m3)	89Sr Error
23	Sr-33	14.06.2011	50	142.0050	37.4810	34	2	137	43
23	Sr-34	14.06.2011	20	142.0050	37.4810	37	3	132	34
23	Sr-35	14.06.2011	10	142.0050	37.4810	28	1	65	21

- The data and metadata can be broken into **unique** and **repeating** components
 - Red highlights unique entries
 - Green highlights repeated entries
- The repeated entries can be separated out from the dataset, placed in a new table and entered only once

Table Tools

File Home Create External Data Database Tools Fields Table

Filter Ascending Descending Selection Advanced Remove Sort Toggle Filter

Sort & Filter

Records New Save Delete Refresh All Totals Spelling More Find Go To Select

Find

Text Formatting Calibri 11 Bold Italic Underline Color Background Color

All Access Objects

Search...

Tables

- dbo_bodypar
- dbo_lab
- dbo_measure**
- dbo_nuclide
- dbo_ref
- dbo_sample
- dbo_samptype
- dbo_sea
- dbo_sedtype
- dbo_species
- dbo_unit

Queries

- sum_samp_id_samps_measures
- sum_samps_measures

sample_id	nuclide_id	unit_id	decayedto	activity	uncertain	detection	profile
3478	33	1		217.56	=		0
3479	33	1		247.53	=		0
3480	33	1		304.88	=		0
3485	33	1		157.99	=		0
3486	33	1		78.44	=		0
3487	33	1		111.74	=		0
3488	33	1		180.56	=		0
3493	33	1		660.82	=		0
3494	33	1		675.62	=		0
3495	33	1		268.62	=		0
3496	33	1		404.04	=		0
3497	33	1		2254.04	=		0
3530	33	1		1140.71	=		0
3535	33	1		3512.41	=		0
3536	33	1		2295.11	=		0
3537	33	1		3849.11	=		0
3538	33	1		542.79	=		0
3544	33	1		550.56	=		0
3545	33	1		207.94	=		0
3546	33	1		142.08	=		0
3547	33	1		239.02	=		0
73834	17	5		0.781	0	<	0
73834	77	5		0.0031	0.000682	=	0

Table Tools
File Home Create External Data Database Tools Fields Table
View Paste Copy Cut Copy Paste Format Painter
Filter Ascending Descending Selection Advanced Refresh All Delete More
Records
Find Replace Go To Select
Calibri 11
Text Formatting

All Access Objects
Search...
Tables
dbo_bodypar
dbo_lab
dbo_measure
dbo_nuclide
dbo_ref
dbo_sample
dbo_samptype
dbo_sea
dbo_sedtype
dbo_species
dbo_unit
Queries
sum_samp_id_samps_measures
sum_samps_measures

sample_id	ref_id	osamcod	samptype_i	sea_id	lab_id	sedtype_id	species_id	bodypar_id	station
1	95	58300	1	15	88	0	0	0	5 - 9
2	95	58301	1	15	88	0	0	0	5 - 26
3	95	58302	1	15	88	0	0	0	5 - 1
4	95	58303	1	15	88	0	0	0	5 - 27
5	95	58304	1	15	88	0	0	0	5 - 2
6	95	58305	1	15	88	0	0	0	5 - 28
7	95	58306	1	15	88	0	0	0	5 - 3
8	95	58307	1	15	88	0	0	0	5 - 29
9	95	58308	1	15	88	0	0	0	5 - 4
10	95	58309	1	15	88	0	0	0	5 - 5
11	95	58310	1	15	88	0	0	0	5 - 30
12	95	58311	1	15	88	0	0	0	5 - 6
13	95	58312	1	15	88	0	0	0	5 - 31
14	95	58313	1	15	88	0	0	0	5 - 32
15	95	58314	1	15	88	0	0	0	5 - 7
16	95	58315	1	15	88	0	0	0	5 - 8
17	95	58316	1	15	88	0	0	0	5 - 10
18	95	58317	1	15	88	0	0	0	5 - 11
19	95	58318	1	15	88	0	0	0	5 - 12
20	95	58319	1	15	88	0	0	0	5 - 14
21	95	58320	1	15	88	0	0	0	5 - 15
22	95	58321	1	15	88	0	0	0	5 - 16
23	95	58322	1	15	88	0	0	0	5 - 25
24	95	58323	1	15	88	0	0	0	5 - 17
25	95	58324	1	15	88	0	0	0	5 - 18
26	95	58325	1	15	88	0	0	0	5 - 19
27	95	58326	1	15	88	0	0	0	5 - 20

140828 maris : Database (Access 2010)

Table Tools

File Home Create External Data Database Tools Fields Table

View Paste Copy Cut Copy Paste Format Painter Filter

Ascending Descending Remove Sort Selection Advanced Toggle Filter

Refresh All New Save Delete More Totals Spelling

Find Go To Select Replace

Calibri 11

B *I* U A ab

Text Formatting

All Access Objects

Search...

Tables

- dbo_bodypar
- dbo_lab
- dbo_measure
- dbo_nuclide
- dbo_ref**
- dbo_sample
- dbo_samptype
- dbo_sea
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- dbo_species
- dbo_unit

Queries

- sum_samp_id_samps_measures
- sum_samps_measures

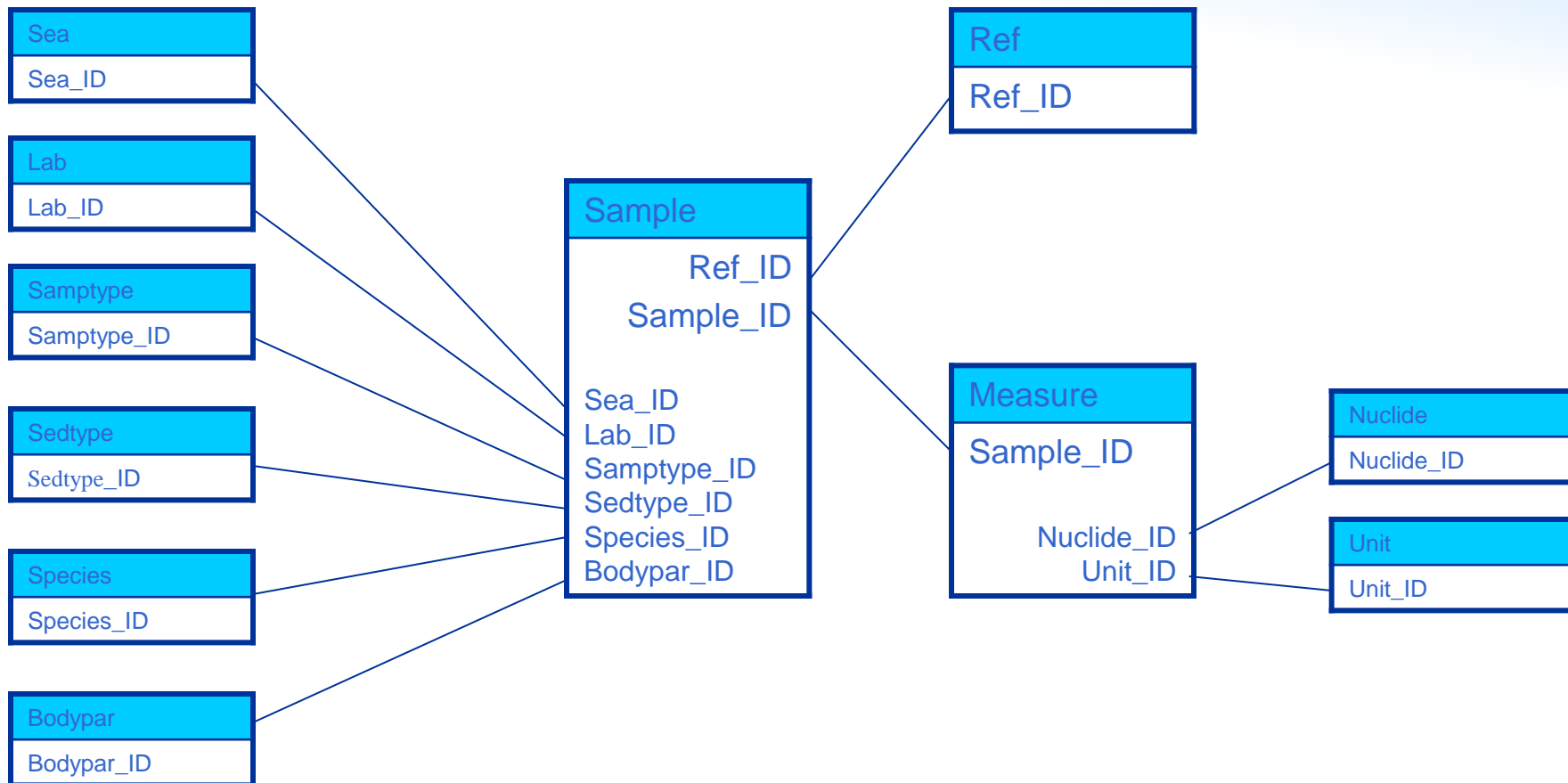
ref_id	database	institute	author	finit	sauthor	sinit	tauthor
2			CRUSIUS	J.	ANDERSON	R.F.	
3			TOP	Z.	CLARKE	W.B.	
6			KAUTSKY	H.	EICKE	H.F.	
8			SMITH	J.N.	WALTON	A.	
9			FUKAI	R.	HOLM	E.	BALLESTRA
10			FUKAI	R.	BALLESTRA	S.	VAS
11			HOLM	E.	BALLESTRA	S.	FUKAI
12			HIGGO	J.J.W.	CHERRY	R.D.	HEYRAUD
13			GUARY	J-C.	HIGGO	J.J.W.	CHERRY
14			BALLESTRA	S.	THEIN	M.	FUKAI
15			FUKAI	R.	BALLESTRA	S.	THEIN
16			CHERRY	R.D.	HEYRAUD	M.	
17			GUARY	J-C.	FOWLER	S.W.	BEASLEY
20			FUKAI	R.	BALLESTRA	S.	VAS
22			FOWLER	S.W.	BALLESTRA	S.	LA ROSA
24			HEYRAUD	M.	CHERRY	R.D.	
25			NIES	H.			
27			KRISHNASWAN	S.	BASKARAN	M.	FOWLER
28			BALLESTRA	S.	BOJANOWSKI	R.	FUKAI
30			OSTLUND	H.G.	GRALL	C.	
31			AARKROG	A.	BUCH	E.	CHEN
41			AARKROG	A.			
44			AARKROG	A.	BUCH	E.	CHEN
57			HAMILTON	T.F.	BALLESTRA	S.	BAXTER
64			OSTLUND	H.G.	STOIVER	M.	

From a dataset to a database

- Why make the effort reorganise the dataset?
 - Removes repetition – more efficient
 - Easier to manage – update one record instead of many
 - Easier to search for data & metadata

- But, the links between the separated records have to be re-established or related
 - This forms the basis of a **relational database**

MARiS – schema



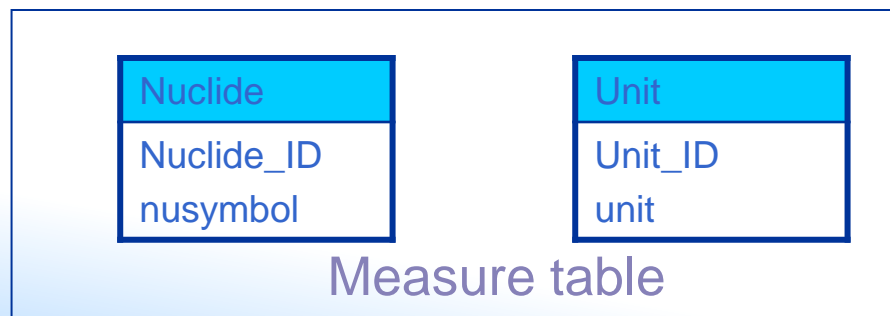
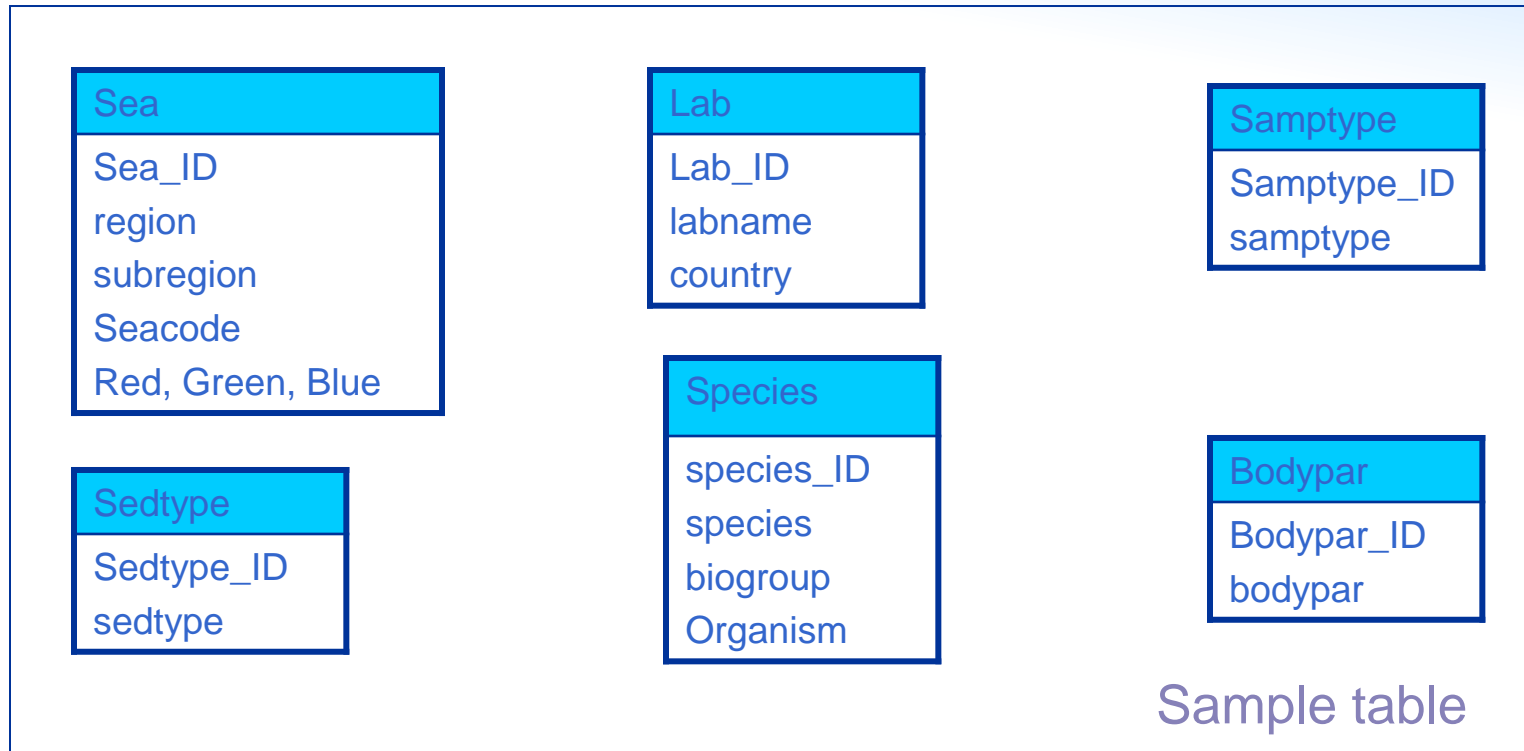
MARiS – Main tables

Ref
ref_id
database
institute
author
finit
yearpub
jname
jvol
fpage
bookt
bookp
title

Sample		
sample_id	station	totdepth
	latchar	sampdepth
samptype_id	lat	salinity
ref_id	latd	temperatur
lab_id	latm	filtered
sea_id	lats	oxygen
sedtype_id	longchar	sliceup
species_id	long	slicedown
bodypar_id	longd	plannet
	longm	begperiod
	longs	endperiod
	longitude	
	latitude	

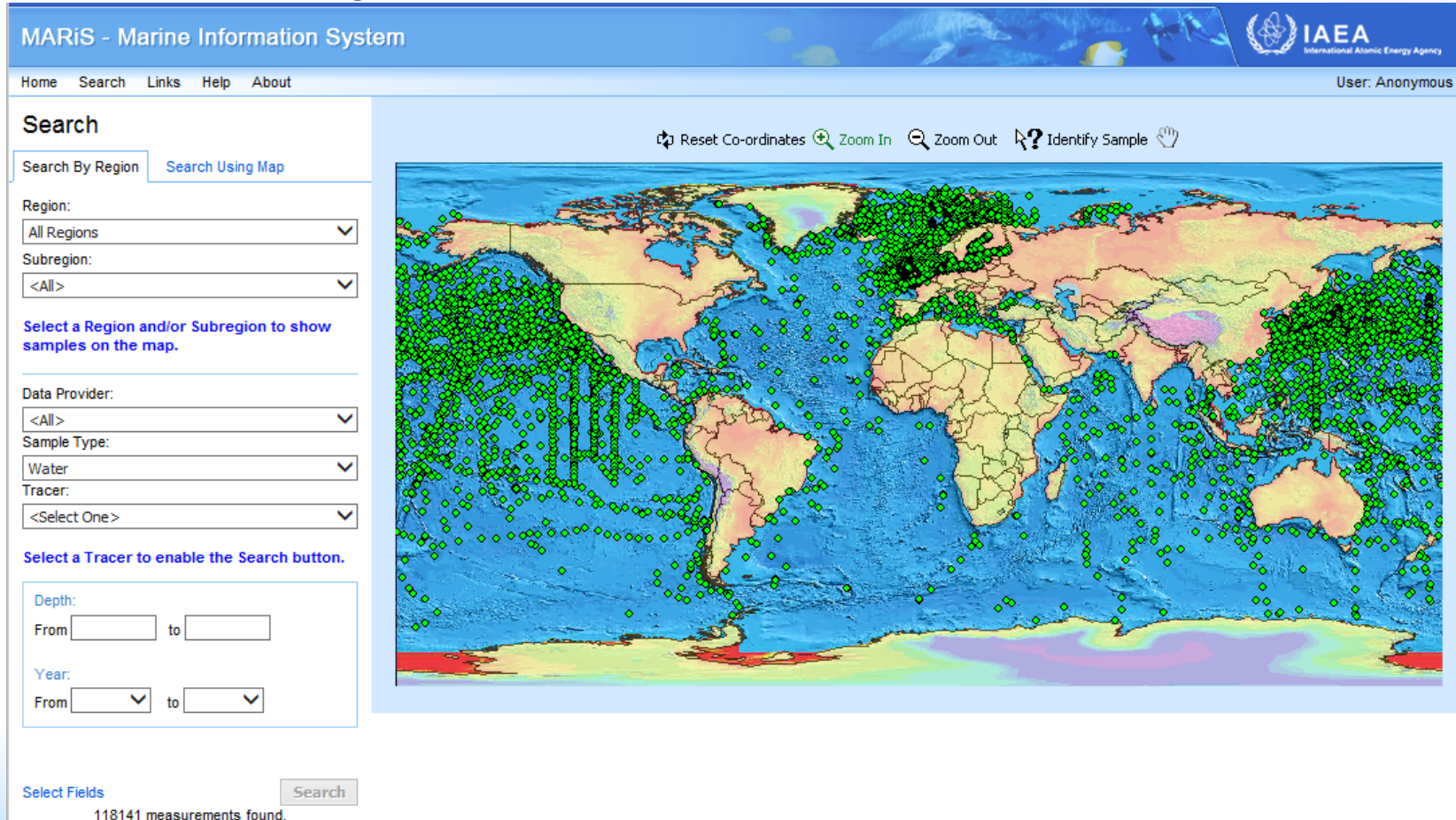
Measure
sample_id
nuclide_id
unit_id
profile
activity
uncertaint
detection

MARiS – lookup tables



MARiS – Marine Information System

- Publically accessible database of marine radionuclides:
maris.iaea.org



The screenshot displays the MARiS website interface. At the top, the title "MARiS - Marine Information System" is visible alongside the IAEA logo and the text "60 Years International Atomic Energy Agency Atoms for Peace and Development". Below the title, there is a navigation menu with "Home", "Search", "Links", "Help", and "About", and a user status indicator "User: Anonymous".

The main content area is divided into a search sidebar on the left and a map on the right. The search sidebar includes a "Search" section with two tabs: "Search By Region" (selected) and "Search Using Map". Under "Search By Region", there are dropdown menus for "Region:" (set to "All Regions") and "Subregion:" (set to "<All>"). Below these is a blue link: "Select a Region and/or Subregion to show samples on the map." Further down, there are dropdown menus for "Data Provider:" (set to "<All>"), "Sample Type:" (set to "Water"), and "Tracer:" (set to "<Select One>"). Below these is another blue link: "Select a Tracer to enable the Search button." At the bottom of the sidebar, there are input fields for "Depth:" (From [] to []) and "Year:" (From [] to []). A "Search" button is located at the bottom right of the sidebar.

The map on the right shows a world map with a color-coded bathymetry or depth scale. Numerous green diamond-shaped markers are scattered across the map, representing marine radionuclide measurements. Above the map, there are interactive controls: "Reset Co-ordinates", "Zoom In", "Zoom Out", "Identify Sample", and a hand icon for panning.

At the bottom of the page, the text "118141 measurements found." is displayed.

MARiS – Select search criteria

Search

[Search By Region](#) [Search Using Map](#)

Region:

Subregion:

Select a Region and/or Subregion to show samples on the map.

Data Provider:

Sample Type:

Tracer:

Select a Tracer to enable the Search button.

Depth:
From to

Year:
From to

110141 measurements found.

MARiS – Select fields

Search

[Search By Region](#) [Search Using Map](#)

Region:
<Select One>

Subregion:
<All>

Select a Region and/or Subregion to show samples on the map.

Data Provider:
<All>

Sample Type:
Water

Tracer:
<Select One>

Select a Tracer to enable the Search button.

Depth:
From to

Year:
From to

Select Fields

Select a region.

Search

Select Fields

Some of the fields are auto-selected, but you can de-select them if you wish. Click "Close" to continue your search.

Position

- SampleID
- Region
- Sub-region
- Station
- Latitude
- Longitude
- Latitude (decimal)
- Longitude (decimal)
- Total depth

Sample Description

- Sample type
- Sampling depth
- Salinity
- Temperature
- Dissolved oxygen
- Sample filtered
- Sampling date (start)
- Sampling date (stop)
- Decay-correction date

Radionuclide/Tracer Data

- Nuclide
- Value type
- Activity or MDA
- Uncertainty
- Unit

Reference

- Country
- Data provider
- Source database provider
- Database
- Authors name
- Second author
- Third author
- Publication year
- Title of paper
- Journal name
- Journal volume/number
- Book title
- First page no.
- Editor(s)
- Provider Sample ID

Close

MARiS – Select fields

Search Results - Returned 54269 Records

[Export to CSV](#) [Back to Search](#)

SampleID	Region	Sub-region	Station	Latitude (decimal)	Longitude (decimal)	Total depth	Sample type	Sampling depth	Sampling date (start)	Decay-correction date	Nuclide	Value type	Activity or MDA	Uncertainty	Unit	Country	Data provider
1	North Atlantic Ocean	North Sea	5 - 9	52.05	4.15		WATE	0	1987-03-09		137Cs	=	14.4	1.584	Bq/m3	FRANCE	IPSN, Institut de Protection DPEI - Commissariat à l'Énergie Atomique
2	North Atlantic Ocean	North Sea	5 - 26	52.67	4.18		WATE	0	1987-03-09		137Cs	=	10.9	1.308	Bq/m3	FRANCE	IPSN, Institut de Protection DPEI - Commissariat à l'Énergie Atomique
3	North Atlantic Ocean	North Sea	5 - 1	52.92	4.68		WATE	0	1987-03-09		137Cs	=	15	1.65	Bq/m3	FRANCE	IPSN, Institut de Protection DPEI - Commissariat à l'Énergie Atomique
4	North Atlantic Ocean	North Sea	5 - 27	52.77	4.00		WATE	0	1987-03-09		137Cs	=	12.6	1.512	Bq/m3	FRANCE	IPSN, Institut de Protection DPEI - Commissariat à l'Énergie Atomique
5	North Atlantic Ocean	North Sea	5 - 2	52.87	4.63		WATE	0	1987-03-09		137Cs	=	12.3	1.476	Bq/m3	FRANCE	IPSN, Institut de Protection DPEI - Commissariat à l'Énergie Atomique
6	North Atlantic Ocean	North Sea	5 - 28	52.85	3.82		WATE	0	1987-03-09		137Cs	=	13.4	1.474	Bq/m3	FRANCE	IPSN, Institut de Protection DPEI - Commissariat à l'Énergie Atomique
7	North Atlantic Ocean	North Sea	5 - 3	52.77	4.57		WATE	0	1987-03-09		137Cs	=	14.8	1.628	Bq/m3	FRANCE	IPSN, Institut de Protection DPEI - Commissariat à l'Énergie Atomique
8	North Atlantic Ocean	North Sea	5 - 29	52.93	4.08		WATE	0	1987-03-09		137Cs	=	14.3	1.573	Bq/m3	FRANCE	IPSN, Institut de Protection DPEI - Commissariat à l'Énergie Atomique
9	North Atlantic Ocean	North Sea	5 - 4	52.65	4.50		WATE	0	1987-03-09		137Cs	=	15.5	1.705	Bq/m3	FRANCE	IPSN, Institut de Protection DPEI - Commissariat à l'Énergie Atomique
10	North Atlantic Ocean	North Sea	5 - 5	52.88	4.43		WATE	0	1987-03-09		137Cs	=	14.7	1.617	Bq/m3	FRANCE	IPSN, Institut de Protection DPEI - Commissariat à l'Énergie Atomique

MARiS - data

- Data originates from
 - Databases of collaborating institutes
 - Reports
 - Published scientific literature
- New data entered into the database
 - New data is entered into GLOMARD*
 - *GLOMARD (Global Marine Radioactivity Database) is the IAEA's in-house database
 - Data is checked and validated
 - Data eligible for public release is then uploaded into MARiS
- Intellectual property protected
 - Data is traceable to the originator or providing database
 - Clearance to include unpublished data is sought from the data provider
 - An acknowledgement reminder is displayed when data is downloaded

MARiS – status June 2016

- ~173,500 radionuclide activity measurements
 - 91,300 samples
 - 54 references (inc. 10 database contributions)
 - Seawater, sediment, biota and suspended matter
 - Main nuclides: ^{137}Cs , ^{134}Cs , ^{90}Sr , $^{239,240}\text{Pu}$, ^3H , ^{14}C
 - >60 natural and anthropogenic radionuclides

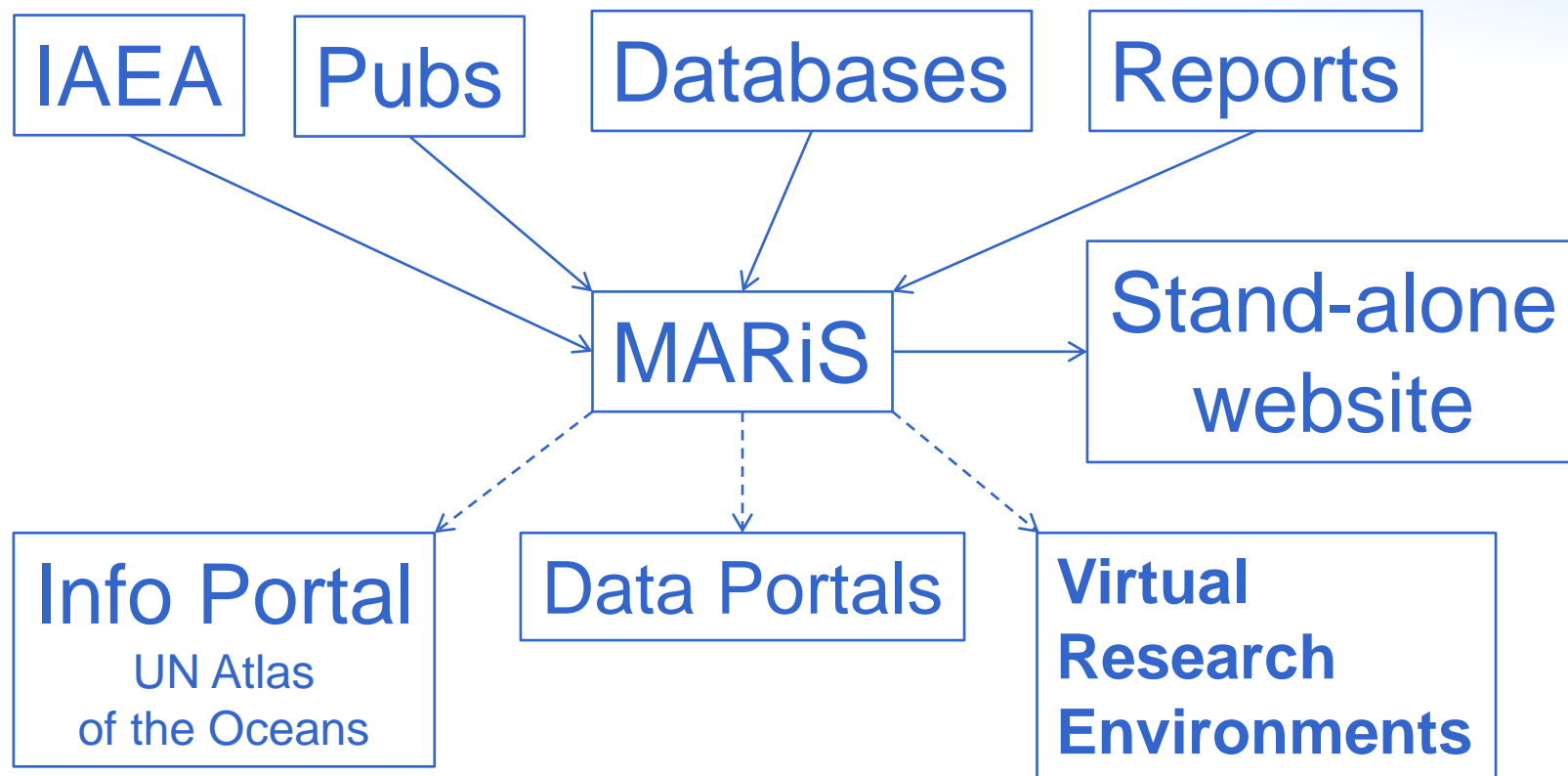
MARiS – data governance

- Data pathway or lifecycle
 - Data received from data provider/originated
 - Check to see if the data is already in MARiS
 - Import data and metadata in to MARiS
 - Document and archive the data reference
 - Serve the data to MARiS database users
 - Please cite the data provider/originator if you use data
 - A citation to MARiS is also encouraged

MARiS – data visualisation

- Tableau
 - Specialist data visualisation software under trial
 - In development and on trial for incorporation into MARiS website
 - 4 predefined visualisations for discovering what references, samples and measurements are contained in the MARiS database
 - Visit this link to see some example visualisation:
<http://public.tableau.com/profile/paul.mcginnity6639#!/>

MARiS - data network



Links

- **MARiS** database website
- www.maris.iaea.org

- **Data visualisation** using Tableau under trial
- <http://public.tableau.com/profile/paul.mcginnity6639#!/>

- **User feedback** for MARiS database development
- <http://goo.gl/forms/gzVsJdq1Df>
- Link on MARiS homepage
- Your feedback will give us the power to develop MARiS



IAEA

60 Years

Atoms for Peace and Development

Thank you!

