

# DATASETS

This document provides an overview of the data that have been made publicly available (together with associated URL or DOI).

## 3D IRELAND PLATFORM:

In collaboration with Geological Survey of Ireland, iCRAG is providing access to several comprehensive datasets and 3D geological models. Data sharing will be through the established data sites managed by the GSI, with interpretations and data types of regional and mine datasets already provided for inclusion on an updated version of site: the site is currently being streamlined by GSI to provide access to 3D models. A small selection of these 3D models and datasets are outlined below: since these are awaiting final public release in the next few months, they are currently available on a password protected site.

*Silvermines*: This 3D model and respective dataset is already currently available publically from iCRAG ([www.icrag-centre.org/research/data/](http://www.icrag-centre.org/research/data/)), but will be placed on the GSI data site when its 3D Model access has been streamlined. The dataset contains a 3D geological model of Upper Devonian to Lower Carboniferous stratigraphies and faults in the Silvermines area, Co. Tipperary, Ireland. This model is based on surface and underground drilling, mining information including historical mine mapping, as well as geological maps. The model extends 6x3km area down to ~ 500m below sea level. This model was built to constrain the normal fault network controlling the Zn-Pb deposit and to constrain fluid flow pathways. This dataset is available at: <https://www.icrag-centre.org/research/data/silvermines/> (username - iCRAG; password - iCRAG2020).

*Lisheen*: This 3D model and respective dataset is already currently available publically from iCRAG ([www.icrag-centre.org/research/data/](http://www.icrag-centre.org/research/data/)), but will be placed on the GSI data site when its 3D Model access has been streamlined. The dataset contains a 3D geological model of Upper Devonian to Lower Carboniferous stratigraphies and faults in the Lisheen area, Co. Kilkenny, Ireland. The model was built to constrain the normal fault network controlling the Zn-Pb deposit and to constrain fluid flow pathways. The 3D model contains a detailed model of the base of Waulsortian Limestone formation horizon and the orebody resource. It also contains the major faults at the Lisheen deposit. The faults and horizon surface were explicitly picked and interpreted using surface and underground drilling, underground face mapping from the Lisheen mine dataset, underground structural information, and mineral resource estimation data, which are all included in the dataset. This dataset is available at: <https://www.icrag-centre.org/research/data/lisheen/> (username - iCRAG; password - iCRAG2020).



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*Lough Allen Basin*: A 3D model comprising several horizons and numerous faults has been defined from the interpretation of seismic, well and map data within the Lower Carboniferous basin centred upon Lough Allen. The original 3D model was developed by iCRAG researchers with an improved version combining newly acquired map data from the GSI. The data have been finalised and agreement been reached on the terms of data provision through download, as follows:

*"Data that is produced directly by the Geological Survey Ireland (GSI) and the Irish Centre for Research in Applied Geoscience (iCRAG) is free for use under the conditions of Creative Commons Attribution 4.0 International license:*

*<https://creativecommons.org/licenses/by/4.0/legalcode>. Under the CC-BY Licence, users must acknowledge the source of the Information in their product or application. Please use this specific attribution statement: "Contains Irish Public Sector Data (Geological Survey and iCRAG) licensed under a Creative Commons Attribution 4.0 International (CC BY 4.0) licence".*

A preview of the 3D model is available at:

<https://www.dropbox.com/s/zhf46qivyx53gfs/Lough%20Allen.wmv?dl=0>

## GEOCHEMISTRY PLATFORM

Geochemical data generated by iCRAG are provided as supplementary material to associated publications, a selection of which are provided below:

Henrichs, I.A., Chew, D.M., O'Sullivan, G.J., Mark, C., McKenna, C., Guyett, P. (2019) Trace-element (Mn-Sr-Y-Th-REE) and U-Pb isotope systematics of metapelitic apatite during progressive greenschist- to amphibolite-facies Barrovian metamorphism. *Geochemistry, Geophysics, Geosystems*, 20, 4103-4129.

<https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2019GC008359>

Ansberque, C., Mark, C., Caulfield, J.T., Chew, D.M. (2019). Combined in-situ determination of halogen (F, Cl) content in igneous and detrital apatite by SEM-EDS and LA-Q-ICPMS: A potential new provenance tool. *Chemical Geology*, 524, 406-420.

<https://www.sciencedirect.com/science/article/abs/pii/S0009254119303328>

Chew, D., Drost, K., Petrus, J.A. (2019) Ultrafast, >50 Hz LA-ICP-MS spot analysis applied to U-Pb dating of zircon and other U-bearing minerals. *Geostandards and Geoanalytical Research*, 43, 39-60. <https://onlinelibrary.wiley.com/doi/full/10.1111/ggr.12257>



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## GEOPHYSICS PLATFORM:

Researchers within this platform have established routes for opensource data access, a selection of which are referred to below:

The Irish National Seismic Network (INSN) is operated by the Dublin Institute of Advanced Studies (DIAS) and supported by GSI. Basic information and links to where data is available from are available at: <http://dx.doi.org/doi:10.7914/SN/EI>.

Associated datasets are hosted at:

GFZ Data Services (GEOFON), Potsdam: <http://geofon.gfz-potsdam.de/fdsnws/dataselect/1/>

IRIS Data Management Center (IRISDMC): <http://service.iris.edu/fdsnws/dataselect/1/>

DIAS broadband seismic data will also be hosted at GEOFON and IRIS, but are not yet open access in order to protect ongoing PhD work and, in some cases, industry confidentiality. These data will be uploaded to repositories after end-project, with sufficient metadata created to satisfy FAIR principles. A related paper makes clear that associated "data are available on reasonable request" to facilitate permissions from an industry partner:

Subašić, S., Piana Agostinetti, N., Bean, C.J. 2020. Assessing the potential of passive seismic receiver functions for ore body exploration. *Geophysical Prospecting*, 68, 2094–2103.

<https://doi.org/10.1111/1365-2478.12992>

## PUBLIC UNDERSTANDING OF GEOSCIENCES PLATFORM:

Data generation and analysis is linked to primary data, collected via surveys, interviews etc. Some of these surveys contain private data, which are not automatically shared but may, upon request, be partly shared for specific purposes like meta-analyses.

Lacchia, A., Schuitema, G., McAuliffe, F. 2020. The human side of geoscientists: comparing geoscientists' and non-geoscientists' cognitive and affective responses to geology. *Geoscience communication*. <https://doi.org/10.5194/gc-2019-24>

Moynihan, A., Schuitema, G. 2020. Values influence public acceptability of geoengineering technologies via self-identities. *Sustainability*, 12, 4591. <https://doi.org/10.3390/su12114591>

Hooks, T., Schuitema, G., McDermott, F., 2019. Risk perceptions toward drinking water quality among private well owners in Ireland: the illusion of control. *Risk Analysis*, <https://doi.org/10.1111/risa.13283>

The raw data for other datasets have been made available including those of a survey on the effects of the COVID pandemic on the minerals industry which was the subject of a paper in SEG Discovery:

Hitzman, M. et al. 2020. Impact of the COVID-19 pandemic on the minerals sector: a real time survey. SEG Discovery, 122, 26-33.

<https://www.segweb.org/pdf/publications/discovery/2020/SEG-Discovery-122-2020-July-COVID-Articles.pdf>

With associated survey results and data provided at:

[https://www.icrag-centre.org/t4media/COVID19%20and%20Minerals%20Sector\\_FINAL.pdf](https://www.icrag-centre.org/t4media/COVID19%20and%20Minerals%20Sector_FINAL.pdf)

## PROTECTION FROM EARTH'S HAZARDS RESEARCH CHALLENGE:

A variety of data types are generated within this spoke. Here we illustrate how iCRAG has provided access to geological and geotechnical constraints associated with research on the siting of potential wind farms within the Irish Sea. Data access is provided through supplementary material to the paper and via the GSI site.

Coughlan, M., Long, M., Doherty, P. 2020. Geological and geotechnical constraints in the Irish Sea for offshore renewable energy. Journal of Maps, 16, 420-431.

<https://doi.org/10.1080/17445647.2020.1758811>

The associated data has been formatted and hosted on the GSI's public viewer:

[https://infomargis.maps.arcgis.com/apps/webappviewer/index.html?id=98cc2826a74b475a\\_a6bcd8e508a9a1d4](https://infomargis.maps.arcgis.com/apps/webappviewer/index.html?id=98cc2826a74b475a_a6bcd8e508a9a1d4)

We are also collecting other geohazard-related datasets, but because of Covid there have been delays in data acquisition: this is a new spoke with activity extending into 2021. For example, we will be acquiring a large dataset in October (originally planned for Spring) which is related to our research on Karst. When these data are generated they will be stored on the GFZ Data Services (GEOFON) website. An illustration of associated data storage is provided by an EU project, FUTUREVOLC, for which iCRAG researchers collected data from a 25 station network, as part of project on the European volcanological supersite in Iceland:

Bean, C. J., Vogfjörð, K.S. 2020. Seismic array data for monitoring and tracking tremor sources during subglacial floods and volcanic eruptions at Vatnajökull (Vatna Glacier), Iceland. GFZ Data Services. Other/Seismic Network. <https://doi.org/10.14470/0Y7568667884>

## SECURE AND PROTECT GROUNDWATER RESOURCES CHALLENGE:



The data generated by groundwater research ranges from geochemical through to hydrogeological. Here we illustrate studies for which data are provided as either supplementary material to a paper or as separate supplementary publication linked to a published paper.

In a study on the behaviour of Ag-NP particles within wastewater treatment systems (septic tanks), associated data are provided within a supplementary pdf:

Bolaños-Benítez, V., McDermott, F., Gill, L., Knappe, J. 2020. Engineered silver nanoparticle (Ag-NP) behaviour in domestic on-site wastewater treatment plants and in sewage sludge amended-soils. *Science of The Total Environment*, 722, 137794.

<https://doi.org/10.1016/j.scitotenv.2020.137794>

A paper investigating the amount of autogenic and allogenic inputs of a karst network in the west of Ireland provides supplementary geochemical data:

Gill, L.W., Babechuk, M.G., Kamber, B.S., McCormack, T., Murphy, C. 2018. Use of trace and rare earth elements to quantify autogenic and allogenic inputs within a lowland karst network. *Applied Geochemistry*, 90, 101-114.

<https://doi.org/10.1016/j.apgeochem.2018.01.001>

A paper investigating biomat development and its impact on effluent distribution and pollutant attenuation was supplemented by a related paper providing the associated data:

Knappe, J., Somlai, C., Fowler, A.C., Gill, L.W. 2020. The influence of pre-treatment on biomat development in soil treatment units. *Journal of Contaminant Hydrology*, 232, 103654.

<https://www.sciencedirect.com/science/article/pii/S0169772220300206>

Knappe, J., Somlai, C., Fowler, A.C., Gill, L.W. 2020. Data for: The influence of pre-treatment on biomat development in soil treatment units", *Mendeley Data*, v1.

<http://dx.doi.org/10.17632/vxh997dtxv.1>

## ENERGY SECURITY CHALLENGE:

The sharing of offshore subsurface data (e.g. well logs, seismic) and interpretations (well picks and horizons) is not permitted under the terms of data provision from both industry and public domain data sources (e.g. Petroleum Affairs Division). The publication of journal research papers is only with the permission of data providers, which has never been withheld for iCRAG research, and access can be provided to some data types generated by iCRAG. For example, sediment provenance studies, one of the key topics of iCRAG's offshore studies, requires the generation of associated, mainly geochemical, data which is provided as supplementary material to associated publications, a couple of examples of which are provided below:



Nauton-Fourteu, M., Tyrrell, S., Morton, A.C., Mark, C., O'Sullivan, G.J. and Chew, D.M. (2020) Constraining recycled detritus in quartz-rich sandstones: insights from a multi-proxy provenance study of the Mid-Carboniferous, Clare Basin, western Ireland. Basin Research <https://onlinelibrary.wiley.com/doi/abs/10.1111/bre.12469>

O'Sullivan, G., Chew, D., Mark, C., Henrichs, I., Morton, A. (2018) An integrated apatite geochronology and geochemistry tool for sedimentary provenance analysis. Geochemistry, Geophysics, Geosystems, 19, 1309–1326, doi:10.1002/2017GC007343.

<https://agupubs.onlinelibrary.wiley.com/doi/10.1002/2017GC007343>

## SAFEGUARDING THE GEOMARINE ENVIRONMENT CHALLENGE:

Marine data are made available through a variety of established online databases. Here we provide a selection of examples.

An iCRAG Co-PI was chief scientist for the GO-SHIP 2017 cruise in the North Atlantic, with the associated data accessible through the CCHDO global database:

<https://cchdo.ucsd.edu/cruise/45CE20170427>

which is also mirrored at the Marine Institute's digital ocean data site:

[http://www.isde.ie/geonetwork/srv/eng/catalog.search#/metadata/ie.marine.data:dataset\\_1498](http://www.isde.ie/geonetwork/srv/eng/catalog.search#/metadata/ie.marine.data:dataset_1498)

iCRAG was also involved in a more recent cruise in the Indian Ocean, with our data soon to supplement the existing database:

<https://cchdo.ucsd.edu/cruise/49NZ20191229>

Our research linked to the Marine Institute, which involves many of the cruises in Irish waters, is retained on the Marine Institute Open Access Repository, a system which is not as accessible as it might be, but is being upgraded. An example of iCRAG-related marine research data are linked to the Western European Shelf Pelagic Acoustic Surveys (WESPAS) which have been conducted in June-July since 2015. Example reports and data are the following:

2019: <https://oar.marine.ie/handle/10793/1462>

2018: <https://oar.marine.ie/handle/10793/1380>

## SUPPLY OF RAW MATERIALS CHALLENGE:

As outlined in 3D MODEL, in collaboration with the Geological Survey of Ireland, iCRAG is providing access to several comprehensive datasets and 3D geological models (see above), including Silvermines and Lisheen mine datasets:

Silvermines: <https://www.icrag-centre.org/research/data/silvermines/>

Lisheen: <https://www.icrag-centre.org/research/data/lisheen/>

On a more regional scale iCRAG is also working on a new version of the Blue Book, an outline of the Carboniferous Stratigraphy of the Irish Orefield which will be made available by the end of the year on the interactive GSI data website. This publication will include well-data, core scan photos, field photos, cross-sections and maps. A brief outline of the Blue Book and a mock-up of what it will look like is provided at the following link:

[https://www.dropbox.com/s/pbusoczstxhbgs/Blue\\_Book\\_Rathdowney\\_Draft%20.pdf?dl=0](https://www.dropbox.com/s/pbusoczstxhbgs/Blue_Book_Rathdowney_Draft%20.pdf?dl=0).

Geochemical data, and in one case computer code (Doran et al. 2020) and a 3D animation (Lang et al. 2020), generated by iCRAG research are provided as supplementary material to associated publications, a selection of which are provided below:

Yesares, L., Drummond, D., Hollis, S.P., Doran, A.L., Menuge, J.F., Boyce, A.J., Blakeman, R. and Ashton, J. (2019) Coupling mineralogy, textures, stable and radiogenic isotopes in identifying ore-forming processes in Irish-type carbonate hosted Zn-Pb deposits. *Minerals*, 9, 335. <https://www.mdpi.com/2075-163X/9/6/335>

Barros, R., Kaeter, D., Menuge, J.F., Škoda, R. (2020) Controls on chemical evolution and rare element enrichment in crystallising albite-spodumene pegmatite and wallrocks: constraints from mineral chemistry. *Lithos* 352-353, 105289. <https://doi.org/10.1016/j.lithos.2019.105289>

Doran, T., O'Sullivan, G., O'Riain, N., Stueeken, E., Goodhue, R. 2020. The application of machine learning methods to aggregate geochemistry predicts quarry source location: An example from Ireland. *Computers & Geosciences*, 140, 104495.

<https://doi.org/10.1016/j.cageo.2020.104495>

Lang, J., Meere, P.A., Unitt, R.P., Johnson, S.C., Solferino, G., Torremans, K., Selby, D., Kyne, R. 2020. The vein-hosted copper deposits of the Allihies mining area, SW Ireland; a new structural and chronological evaluation. *Journal of the Geological Society*, 177, 671-685. <https://doi.org/10.1144/jgs2019-154>

Lingli, Z. McKenna, C.A., Long, D.G.F. Kamber, B.S. 2017. LA-ICP-MS elemental mapping of pyrite: An application to the Palaeoproterozoic atmosphere. *Precambrian Research*, 297, 33-55. <https://doi.org/10.1016/j.precamres.2017.05.008>



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