MINDeSEA

Seabed Mineral Deposits in European Seas: Metallogeny and Geological Potential for Strategic and Critical Raw Materials

Deliverable 4.4: Metallogenic Map of Ferromanganese Crust and Phosphorite Occurrences in pan-European Seas

WP1 leader:
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**Long Title**

Deliverable 4.4 – Models of formation for the main provinces of ferromanganese crusts and phosphorites - Metallogenic Map of Ferromanganese Crust and Phosphorite Occurrences in pan-European Seas

**Short Description**

This document presents the metallogenic map for ferromanganese crusts and phosphorites in pan-European seas.

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**Dissemination level**

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Metallogenic Map of Ferromanganese Crust and Phosphorite Occurrences in pan-European Seas

Compiled by: F.J. González, E. Marino, L. Somoza, T. Medialdea, A. Lobato, I. Blasco (IGME); T. Kuhn, C. Ruehlemann (BGR); P. Ferreira (LNEG); T. Alcorn (GSI); V. Magalhaes (IPMA); J.R. Hein (USGS); G. Cherkashov (VNIIO)

INTRODUCTION

This report contains explanatory material for the map of ferromanganese crust and phosphorite mineral occurrences and metallogenic areas in pan-European seas. The map region includes North east Atlantic Ocean, Arctic Ocean, Baltic, Mediterranean and Black seas.

This is a cooperative product under the project “Seabed Mineral Deposits in European Seas: Metallogeny and Geological Potential for Strategic and Critical Raw Materials” (MINDeSEA), materialized in the frame of the GeoERA Raw Materials Theme (Grant Agreement Nº 731166, project GeoE.171.001), resulted from the collaboration between eight GeoERA Partners and four Non-funded Organizations at various points of common interest for exploration and investigation on seafloor mineral deposits.

This report is part of a series of MINDeSEA reports on the metallogenesis of European seafloor mineral resources. The studies include (1) detailed metallogenic maps of submarine mineral occurrences; (2) a compilation of major seafloor mineral deposit models; (3) a series of metallogenic provinces and descriptions; (4) location map of submarine mineral occurrences; (5) a database on seabed mineral occurrences; (6) vocabularies and (7) references material.

This report provides a digital file for maps of seafloor mineral occurrences and metallogenic areas. The purpose of the digital map and brief descriptions in this report is to provide large-format color maps, mainly in Acrobat PDF format, as compared to the page-size figures in Deliverable 4.4: Models of formation for the main provinces of ferromanganese crusts and phosphorites. The digital version on the metallogenic areas have been prepared and delivered as part of the report and will be made available through the European Geological Data Infrastructure (EGDI) information platform (http://www.europe-geology.eu/). Detailed descriptions of geology, mineral occurrences, and metallogenic provinces depicted in the map are provided in the Deliverable 4.4.

The seafloor ferromanganese crusts and phosphorites database in pan-European seas includes more than 150 occurrences within the North-east Atlantic Ocean, the Arctic Ocean and the Western Mediterranean Sea. In the occurrence database, information on the occurrences includes the location, mining activity, metallic commodities, geological setting, age, ore mineralogy, chemistry, style of mineralisation, genetic models, and the primary sources of data with a comment onto data
quality. INSPIRE compliant and harmonized vocabularies have been used to design and complete the datasets. All information is collected from public sources of data including published literature, archive reports, press releases and company Internet pages. The coverage has mainly been created by digitization and synthesis of data after applying standardization and harmonization criterions. The input maps from all marine areas have been collected at a 1:250,000 scales or less and permits verification of this synthesis at a 1:10,000,000 scale. The structure of the database is described in detail in the Deliverable 4.4.

The database and the maps can be used in regional geological and metallogenic research, in regional- and local-scale minerals exploration planning, environmental studies and maritime spatial planning.

The background bathymetric map of European seas is the ESRI’s Ocean basemap. Data are from the General Bathymetric Chart of the Oceans (GEBCO) international terrain database. This base map was designed and developed by ESRI.

**ACKNOWLEDGEMENT & DISCLAIMER**

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Metallogenic Map of Ferromanganese Crust and Phosphorite Occurrences in pan-European Seas

Scale 1:10,000,000

Last Update: May 2021


Portuguese Institute for Sea and Atmosphere (IPMA), Lisboa, Portugal; www.ipma.pt

Geological Survey Ireland (GSI), Dublin, Ireland; https://www.gsi.ie/


For additional information see: http://continentalshelf.org/onestopdatashop/630.aspx


Phosphorites

24° -< 1000 sq Km

Mid-Atlantic Ridge

1.000

Norwegian Sea

28 - King’s Trough 6

27 - King’s Trough 5

25 - King’s Trough 3

22 - CDRC002690

21 - CDRC003061

17 - Mid-Atlantic Ridge 8

16 - Mid-Atlantic Ridge 7

13 - Mid-Atlantic Ridge 4

9 - South La Palma Ridge

8 - South El Hierro Ridge

6 - North Conception Bank Seamount

5 - M1 Mount (E Lanzarote)

4 - Le Danois Bank (El Cachucho)

2 - Dacia Seamount

12 - Príncipe de Avis Seamounts

141 - CDRC002832

137 - CDRC003258

136 - Azores-Biscay Rise 1

135 - CDRC002843

134 - Loch Fyne

133 - Kandalakskiy Zaliv

111 - King’s Trough 9

108 - Antialtair Seamount

107 - Mid-Atlantic Ridge 23

106 - Mid-Atlantic Ridge 22

105 - Mid-Atlantic Ridge 21

104 - Mid-Atlantic Ridge 20

103 - Mid-Atlantic Ridge 19

102 - Mid-Atlantic Ridge 18

101 - Mid-Atlantic Ridge 17

100 - Mid-Atlantic Ridge 16

99 - Mid-Atlantic Ridge 15

98 - Mid-Atlantic Ridge 14

97 - Mid-Atlantic Ridge 13

96 - Mid-Atlantic Ridge 12

95 - Mid-Atlantic Ridge 11

94 - Mid-Atlantic Ridge 10

93 - Tore Seamount

92 - Tore Seamount

88 - North Flank Tenerife Island

87 - North Flank Tenerife Island

86 - North Flank Tenerife Island

85 - North Flank Tenerife Island

84 - North Flank Tenerife Island

83 - North Flank Tenerife Island

82 - Vøring Plateau

81 - Vøring Plateau

80 - Hovgaard Ridge

79 - Hovgaard Ridge

78 - Hovgaard Ridge

77 - Greenland Sea 4

76 - Greenland Sea 3

75 - Greenland Sea 2

74 - Norwegian Sea 12

73 - Norwegian Sea 11

72 - Norwegian Sea 10

71 - Norwegian Sea 9

70 - Norwegian Sea 8

69 - Norwegian Sea 7

68 - Norwegian Sea 6

67 - Norwegian Sea 5

66 - Norwegian Sea 4

65 - Norwegian Sea 3

64 - Norwegian Sea 2

63 - Norwegian Sea 1

62 - Norwegian Sea

61 - Norwegian Sea 1

58 - Dragon Bank

57 - Reykjanes Ridge

56 - Reykjanes Ridge

55 - Reykjanes Ridge

54 - Mid-Atlantic Ridge 21

53 - Godzilla Seamount

52 - North Conception Bank Seamount

51 - North Conception Bank Seamount

50 - North Conception Bank Seamount

49 - North Conception Bank Seamount

48 - North Conception Bank Seamount

47 - North Conception Bank Seamount

46 - North Conception Bank Seamount

45 - North Conception Bank Seamount

44 - North Conception Bank Seamount

43 - North Conception Bank Seamount

42 - Mid-Atlantic Ridge 13

41 - Mid-Atlantic Ridge 12

40 - Mid-Atlantic Ridge 11

39 - Sancho Seamount

38 - Tropic Seamount

37 - Norwegian Sea 10

36 - Norwegian Sea 9

35 - Norwegian Sea 8

34 - Norwegian Sea 7

33 - Norwegian Sea 6

32 - Norwegian Sea 5

31 - Norwegian Sea 4

30 - Mid-Atlantic Ridge 11

29 - Mid-Atlantic Ridge 10

28 - Mid-Atlantic Ridge 9

27 - Mid-Atlantic Ridge 8

26 - Mid-Atlantic Ridge 7

25 - Mid-Atlantic Ridge 6

24 - Mid-Atlantic Ridge 5

23 - Mid-Atlantic Ridge 4

22 - Mid-Atlantic Ridge 3

21 - Mid-Atlantic Ridge 2

20 - Mid-Atlantic Ridge 1

19 - Mid-Atlantic Ridge

18 - Mid-Atlantic Ridge

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16 - Mid-Atlantic Ridge

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10 - Mid-Atlantic Ridge

9 - Mid-Atlantic Ridge

8 - Mid-Atlantic Ridge

7 - Mid-Atlantic Ridge

6 - Mid-Atlantic Ridge

5 - Mid-Atlantic Ridge

4 - Mid-Atlantic Ridge

3 - Mid-Atlantic Ridge

2 - Mid-Atlantic Ridge

1 - Mid-Atlantic Ridge

0 - Mid-Atlantic Ridge

A: Madeira/Tore Rise

B: Canary Island Seamount Province

C: Mid Atlantic Ridge