# The coastMap Approach for Visualization and Dissemination of Marine Geodata

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coastMap is a coastal data portal with a focus on the North Sea and offers campaign data, model analysis tools and thematic maps predominantly in the Biogeosciences. Important research topics are highlighted by Spotlights, an edited form of scientific information for non-experts. In order to address the large variety of formats of the accessible data and the different user groups of the portal (modeling and non-modeling scientists, policy makers and the interested public) the coastMap technical infrastructure is highly diverse.
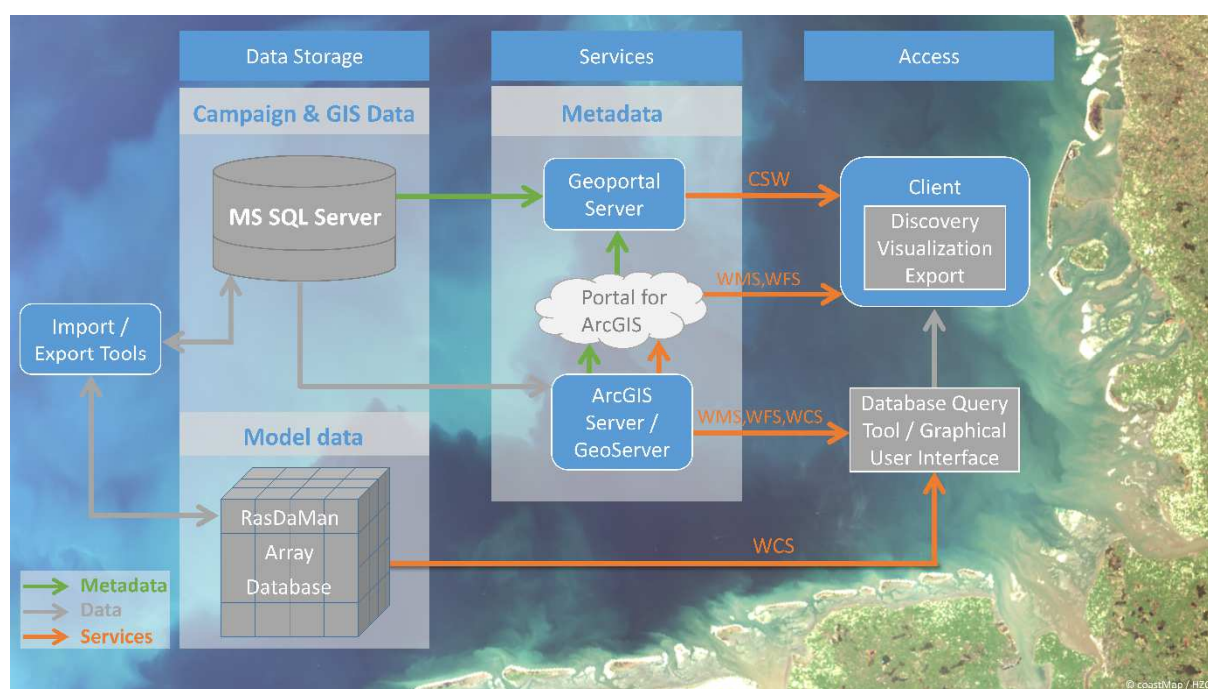


*Figure 1: Overview of coastMap technical infrastructure including data, metadata and service flows*

In Figure 1, the technical infrastructure of coastMap is schematically displayed. It is separated in data storage, services and access of the user to the information.

Marine data from research campaigns is highly complex in its description, which requires extensive metadata for useful access of the data. The data and its metadata are stored in the relational database MS SQL Server allowing targeted queries. These queries can be sent using the Graphical User Interface (GUI) to search the data for particular information.

The biogeochemical model data is vast but comparatively simple in metadata and is stored in the RasDaMan Array Database. It is set up with a Web Coverage Service (WCS) that feeds into the GUI of the Model Analysis Tool.

The data for the thematic maps are stored in the Portal for ArcGIS cloud and its metadata on the MS SQL Server. The Geoportal Server publishes the metadata for all maps using a Catalog Service for the Web (CSW). Web Map Services (WMS) and Web Feature Services (WFS) convey the maps and data to the client. The Spotlights are conceptualized and published in the Portal for ArcGIS Cloud environment.

Using the GeoServer as an intermediary, the campaign data is made freely available on the web through Web Feature Services. The WFS request is assembled according to the query requests given by the user in the GUI. The data are visualized in maps and provided to the client as download links.

The coastMap Model Analysis Tool allows data analysis, management, discovery and visualization of large quantities of marine and atmospheric model data. The focus of the tool is set on creating timely responses for any user defined spatial and temporal subsetting of the data. The intermediary scripting enables data reformatting, so that the user receives the output in the desired format, such as netCDF files and file geodatabases. The front end is set up with an ArcGIS Server, which provides the user with a relatively simple GUI and a well-developed website design.
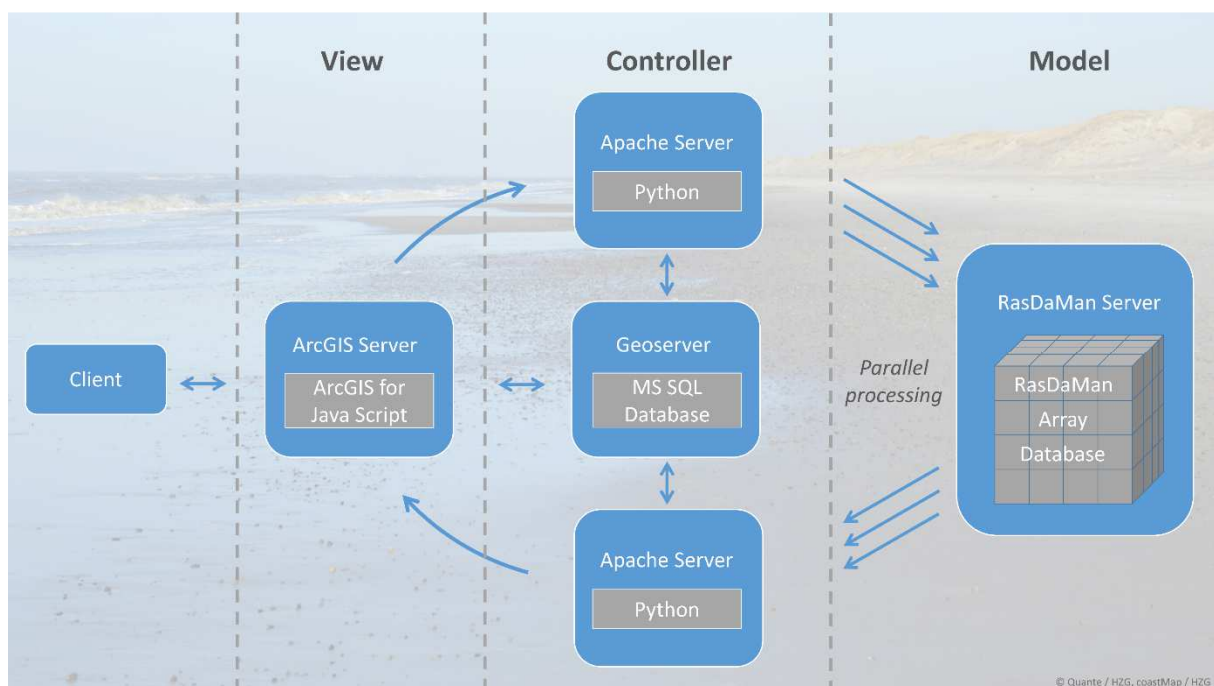


*Figure 2: Architectural pattern of the coastMap Model Analysis Tool*

The architecture of the Model Analysis Tool follows the model-view-controller (MVC) software development paradigm and is displayed in Figure 2. The high-resolution model data is stored in the RasDaMan multidimensional Array Database on the RasDaMan Server. For optimal performance, the user requests for analysis and data access are split into parallel processes by Python scripts. These processes formulate rasql queries, which are received by the Web Coverage Processing Service (WCPS) of the RasDaMan Server. Further Python scripts recombine the query results, reformat them and deliver them to the user. The User Interface is configured to be derived from the model metadata that is stored in the MS SQL database and delivered by the Geoserver.

The coastal data portal coastMap has a fully developed infrastructure including a variety of services and tools required to publish all different kinds of marine data and data products to different user groups. It can serve as an example for other data portals struggling with the integration of the heterogeneous data landscape and the requirements of different stakeholders.