Geospatial meteorological and climatic data services application programming interface (API)

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Introduction

At present bringing software to the Earth science data is becoming increasingly necessary, taking into account the upcoming volume of big environmental datasets. Modern distributed information-computational infrastructure aiming at complex usage of heterogeneous geospatial datasets is based on the Spatial Data Infrastructure concepts [2], which represents a combination geospatial data, metadata, approved standards as well as geospatial web services for access, computational processing and cartographic visualization [3]. There are two main architectural styles most commonly used during web service development: SOAP (Simple Object Access Protocol) and REST (Representational State Transfer) [4], that was chosen for further development. RESTful Web services allow the requesting systems to access and manipulate textual representations of Web resources by using a uniform and predefined set of stateless operations.

Climate API HTTP request	Description	
Utility processes		
POST	Lists meteorological parameters available for	
/processes/MeteorologicalParameters	processing class (Average, etc.)	
POST /processes/Collections	Lists data collections available for the processing class	
	and meteoparameter	
POST /processes/Scenarios	Lists modeling scenarios for the data collection	
	specified	
POST /processes/SpatialResolutions	Lists spatial resolutions for the collection and scenario	
	specified	
POST /processes/TimeSteps	List time steps for the collection, scenario and spatial resolution specified	
Figure 1 presents Climate API UML diagram displaying basic web services.		

WPS (Web Processing Service) is an OGC standard for distributed geospatial data processing services. The advantages of using WPS for data processing and analysis are the following:

 Output data of one process can be the input data of another one thus presenting data analysis task as a workflow

• Processes could be designed independently

The main goal of the work is to present the approach that provides unified access to web processing services (WPS) developed for climate and meteorological research using "Climate" platform, based on the latest technological and scientific achievements.

Methodology

A Web API represents an application programming interface for either a web server (server side) or a web browser (client side). A server-side Web API is a programmatic interface of the defined request–response message system (web service), typically expressed in JSON or XML. To apply Web API approach to RESTful web services, an OpenAPI Specification [5] is employed, which specifies machine-readable interface files for describing, using, and visualizing RESTful web services.

At present the OGC API family of standards (https://ogcapi.ogc.org/) are being developed based on OGC Web Service standards (WMS, WFS, WPS) to facilitate web access to geospatial data and tools. The "OGC API - Processes" standard draft was created based on the WPS 2.0 specification. It focuses on a simple RESTful core specified as reusable OpenAPI components. In the following table basic OGC API HTTP requests are presented with corresponding WPS requests:

Table 1. OGC API requests

OGC API HTTP request	Description	WPS Request
GET /processes	Lists the processes this API offers	GetCapabilities
GET /processes/{process-id}	Returns a detailed description of a	DescribeProcess
	process	
POST /processes/{process- id}/jobs	Executes a process, i.e. creates a new job. Inputs and outputs will have to be specified in a JSON document that needs to be send in the POST body.	Execute



Figure 1. Climate API UML diagram

Conclusion

The Climate Web API presented provides software basis for advanced development and usage of "Climate" platform web processing services aiming at climate change studies at regional and global levels. The correct implementation of the proposed specification will form a solid foundation for further development of desktop client applications in the form of GIS plugins, as well as universal web-GIS clients easily embedded into thematic virtual research environments.

Climate Web API

Based on the "OGC API - Processes" standard, the Climate Web API is proposed to provide uniform access to "Climate" platform geospatial services. Table 2 presents typical computational and utility services required for platform functioning:

Table 2. Climate API requests

Climate API HTTP request	Description	
Computational processes		
POST /processes/classes	Lists the processing classes providing statistical analysis of geospatial data	
POST /processes/classes/Average	Calculates average value of the variable provided	
POST /processes/classes/Minimum	Calculates minimum value of the variable provided	
POST /processes/classes/Maximum	Calculates maximum value of the variable provided	
POST	Calculates number of icing days for the period provided	
/processes/classes/NumberoficingDays		
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