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ORFEUS Services and Activities to Promote Observational Seismology in Europe and beyond

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ORFEUS (Observatories and Research Facilities for European Seismology; <http://orfeus-eu.org/>) is a non-profit foundation that promotes observational seismology in the Euro-Mediterranean area through the collection, archival and distribution of seismic waveform data, metadata, and closely related services and products. The data and services are collected or developed at national level by more than 60 contributing Institutions in Pan-Europe and further enhanced, integrated, standardized, homogenized and promoted through ORFEUS. Among the goals of ORFEUS are: (a) the development and coordination of waveform data products; (b) the coordination of a European data distribution system, and the support for seismic networks in archiving and exchanging digital seismic waveform data; (c) the encouragement of the adoption of best practices for seismic network operation, data quality control and FAIR data management; (d) the promotion of open access to seismic waveform data, products and services for the broader Earth science community. These goals are achieved through the development and maintenance of services targeted to a broad community of seismological data users, ranging from earth scientists to earthquake engineering practitioners. Two Service Management Committees (SMCs) are consolidated within ORFEUS devoted to managing, operating and developing (with the support of one or more Infrastructure Development Groups): (i) the European Integrated Data Archive (EIDA; <https://www.orfeus-eu.org/data/eida/>); and (ii) the European Strong-Motion databases (SM; <https://www.orfeus-eu.org/data/strong/>). New emerging groups within ORFEUS are focused on mobile pools and computational seismology. ORFEUS services currently provide access to the waveforms acquired by ~ 14,500 stations, including dense temporary experiments, with strong

emphasis on open, high-quality data. Contributing to ORFEUS data archives means benefitting from long-term archival, state-of-the-art quality control, improved access, increased usage, and community participation. Access to data and products is ensured through state-of-the-art information and communication technologies, with strong emphasis on federated web services that considerably improve seamless user access to data gathered and/or distributed by the various ORFEUS institutions. Web services also facilitate the automation of downstream products. Particular attention is paid to adopting clear policies and licenses, and acknowledging the crucial role played by data providers / owners, who are part of the ORFEUS community. There are significant efforts by ORFEUS participating Institutions to enhance the existing services to tackle the challenges posed by the Big Data Era, with emphasis on data quality, improved user experience, and implementation of strategies for scalability, high-volume data access and archival. ORFEUS data and services are assessed and improved through the technical and scientific feedback of a User Advisory Group (UAG), which comprises European Earth scientists with expertise on a broad range of disciplines. All ORFEUS services are developed in coordination with EPOS and are largely integrated in the EPOS Data Access Portal, as ORFEUS is one of the founding Parties and fundamental contributors of the EPOS Thematic Core Service for Seismology (<https://www.epos-eu.org/tcs/seismology>). In this contribution, we selectively present the activities of ORFEUS, with the main aims of facilitating seismological data discovery and encouraging open data sharing and integration, as well as promoting best practice in observational seismology.