

GRUPPO NAZIONALE PER LA DIFESA DAI TERREMOTI  
FRAMEWORK PROGRAM 2000-2002  
COORDINATE PROJECT PROPOSAL

**REVISION OF THE THEORETICAL AND EXPERIMENTAL GROUNDS OF HAZARD  
ESTIMATES AT NATIONAL SCALE**

SCIENTIFIC COORDINATOR

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RE-PROPOSITION OF THE PROJECT FOR A BIENNIAL DURATION, ACCORDING TO  
REFEREE EVALUATIONS

**Preliminary statement**

The present re-proposition has been formulated on the basis of the clear comments of the referees indicating the macroseismics as the main investigation topic that deserves to be continued. As they also suggested the integration with the Amato's Project, as soon as the evaluation results has been communicated, the Coordinator of the present project contacted Alessandro Amato in order to know his willingness to collaborate and to integrate the two projects. However due lack of time, also related to the Easter holidays, there were not the possibility to come to a general agreement which formally integrates the two project. However we want to express our intention to proceed toward a strict cooperation and integration in the future.

As the uncertainties on the available budget make rather hard a univocal formulation of the project, we prepared a "stratified" proposal that is structured in such a way to allow three different levels of

approval and consequently of funding. In this framework the project must be seen as a unique container including research topics with different priority. At the minimal level we have mainly the macroseismic investigations, that were considered with priority by the Commission. At the second level there are investigations on different topics, already started off during the first year but not considered with priority by the Commission, and at the third one investigations, originally proposed by this project and not started off in first year, that could be carried on only in strict cooperation with the Amato's project. In re-proposing activities in fields different from macroseismics, we tried to interpret the spirit of the guide-line, recently emerged inside GNDT, that is to fill the gaps in topics of Theme 1 of the Framework Project 2000/2002, not covered by the approved projects (see the recent call for proposals in the field of the evaluation of the vulnerability at a national scale).

Among the researches carried out in the first year of our project that certainly are superimposed with corresponding topics of the Amato's Project, there are Task 3 (Seismogenic model), Task 6A (Seismic velocity tomography), Task 6B (Seismic phases attenuation tomography), Task 7 (Focal mechanisms) and Task 9 (Geodetic measurements). Among them, the former three are almost exactly coincident with corresponding activities of the Amato's Project, while both the focal mechanisms and the geodetic measurements are widely complementary. In particular for the focal mechanisms, only the part concerning the regional CMT mechanisms has been recently and only partially integrated in the Amato's project (but without funding) while for the geodetic measurements our project follows a very different approach with respect to Amato's one.

We will recall here the main results we have obtained in these latter two tasks, and the differences in the approach between the Amato's Project and our one, in order to furnish to the Commission a starting point to evaluate the proposed activities.

Concerning the focal mechanisms, in the first year of the project we collected most of the focal plane solutions available in the literature, for Italy and surrounding regions, and included them in a MS-ACCESS database after the checking of their correctness. Presently the database includes more than 5000 focal solutions, excluding the Harvard CMT catalog and the Regional CMT (RCMT) catalogs compiled by INGV and ETH. On this topics we recently submitted, to an international journal, two papers. The first one describes the MS-ACCESS application allowing to acquire and select the revised mechanisms (Vannucci & Gasperini, 2002) while the second one presents the library of Fortran procedures we have used to check the mechanisms (Gasperini & Vannucci, 2002). In the ambit of the same Task, this project also partially supported the activity of the INGV Working Group on Regional CMT mechanisms that recently published (Pondrelli *et al.*, 2002) and made at public disposition on the

web site of INGV all the solutions computed from 1997 to present. We propose here to continue to financially “feed” these initiatives that represent important tools for any seismotectonic analysis and that, for their nature, continue in time as open-files, ready to include any new paper or seismic event respectively.

Concerning the geodetic measurements, we remind that, while the Amato’s Project proposed a “reoccupation”, using GPS techniques, of the sites of the historical network of the Italian Military Geographical Institute (IGM), in order to evaluate the deformations with respect to the measurements made starting from the end of XIX century, we proposed instead the design of a “new” network, more specifically oriented to the characteristics of modern satellite measurements and specifically finalized to the measure of interseismic deformation. Note that in the original formulation of our project we clearly indicated the reasons of such a choice and of our decision to “abandon” in most cases the IGM sites. Such arguments regard the difficulty to verify the coincidence of the presently known IGM vertex with the historical ones; the scarce accessibility of the IGM benchmarks due to the requirement, common to all old triangulation networks, to have sites in reciprocal optical view; the inadequacy of the geometrical structure of the network that was originally designed for cartographic framing and not for the evaluation of seismic deformation. Our arguments also concern more generally the uncertainties of the XIX and XX centuries measurements with respect to the expected deformation rates (some mm/year) and the relative scale of classical and satellite measurements. In light of these considerations we proposed a network of semi-permanent stations (not continuously equipped with GPS receivers but with logistic supplies allowing long unattended measurements campaigns) located on the basis of precise criteria (shape of the network, distance from the seismic sources, choice of geologically stable sites, etc.) and specifically oriented to the reliable measure of inter-seismic deformation. On this topic, in the first year of activity of the project, we established the criteria to choose the sites as and we actually installed 3 new stations in southern and central Italy. It is obvious that the activities on this topic are subordinate to the acceptance by the Commission of the above considerations. Otherwise the entire task would be dropped.

A task that does not present almost any superposition with the Amato’s Project is Task 5 (Statistics of seismic sources and catalog completeness) as such project has chosen *a priori* the “seismic gap” as preferred seismic occurrence model. Although such Task was formally started, it has not really been active in the first year. In our opinion this Tasks represents a mandatory step to formulate a reliable seismic hazard model. We must also consider that recently a new Instrumental Catalog of Italian

Earthquakes (CSTI) has been made available (CSTI Working Group, 2001), which publication was partially supported by our project, and which data had not been adequately analyzed yet.

Concerning the tasks not activated in the first year of the project, Task 1 (Historical seismic catalog) appears, at a first glance, to almost completely fulfill the referee recommendations, as it regards investigations essentially based on macroseismic data. However, due to the strong financial effort requested at the time of first proposition, we do not believe that its full re-proposition, even if possible, is fully suitable and really matches the spirit of the issues of the Commission. Anyhow, in particular Task 1A, regarding the continuation of the already started process of unification and standardization of the Italian historical catalog, owns several interesting aspects for hazard assessments and is strictly linked to other activities of this project (Task 5 and 6C). This unification process, started up in early 1997, brought to the publication of the Parametric Catalog of Italian Earthquakes (CPTI) (CPTI Working Group, 1999). Such catalog, resulting from the merging of previous NT and CFTI, is presently the main reference dataset for hazard assessment. We must recall that authors of CPTI originally planned the issuing of a second release, where the integration of the two parents catalog would be extended to the felt report data (not included in CPTI), and of a third release where all the patrimony of available information would be merged and integrated. Unfortunately the abandon of this Task, according to the referee comments, prevented the completion of this plan. These activities however do not completely ceased and at this moment we are still working to an integration of the catalog for the period from 1980 to 1997, on the basis of the new data of the INGV macroseismic Bulletin and of the revised instrumental data coming from CSTI. Hence in the following, we will request the priority reactivation, but with reduced founding, of Task 1A. This will also include the developments of the technique presently used (Gasperini et al., 1999) to parametrize the historical earthquakes on the basis of the macroseismic data.

A last activity that we re-propose, even if with less priority with respect to the previous ones, concerns a topic originally included in Task 2 (Instrumental seismic catalog). This Task, not formally activated in the first year of the project, is fully superimposed with activities of the Amato's Project. Our re-proposition is originated by the lack of significant improvements, as explicitly admitted in the first year report of the Amato's Project, with respect to the former state of the art (the above mentioned CSTI). This failure can be addressed in part, to a delay in the publication of CSTI itself, that has been officially delivered to the Amato's Project in March 2001 (but not in June of same year as erroneously reported on the annual report of the Amato's Project). Certainly the resign from the Amato's project of the responsible (personally confirmed by Rita Digiovambattista to the Coordinator of the present project)

also contributed to this reduced productivity. On this topic we foretell it is possible a strict integration among the two project. Our role could be in particular to attend to the revision of the local magnitudes with special regard to the periods after 1996 and before 1981, when we have observed biases in the estimates (Lolli and Gasperini, 2002).

From the administrative point of view, the participants to the present project will be subdivided in two Research Units: one at the Dipartimento di Fisica of the University of Bologna (Responsible: Paolo Gasperini) and another one at the Istituto Nazionale di Geofisica e Vulcanologia of Rome (Responsible: Marco Anzidei). The latter will include only the researchers belonging to INGV that are related to Task 9A (Geodetic Measurements) and will be activated only if the Commission will approve such task. All other researchers, including the INGV ones not involved in Task 9A, will be included in the Bologna Research Unit that, in case, will arrange sub contracts with other INGV sections and with the private research company SGA.

## **Programs and objectives of the proposed investigations**

### **Priority 1**

#### **Activities in the ambit of macroseismics, considered with priority by the Commission of referees**

Task 1, HISTORICAL SEISMIC CATALOG (Responsible: Gasperini, Collaborators: Albarello, Bernardini, Camassi, Carletti, Castelli, Ercolani, Lolli, Monachesi, Vannucci and SGA Working Group)

As already noted above, this Task was originally proposed to continue the process of unification of the Italian historical seismic catalogue started up in early 1997 and that brought to the publication of the Parametric Catalog of Italian Earthquakes (CPTI Working Group, 1999). Most of the investigators involved in this Task also participated to such unification process and were authors of the CPTI. Although the original motivations of the project are still valid, for reasons of budget, we decided to not re-propose the original program of this Task and to limit our activity to more restricted objectives. We thus decided to only propose the update of the catalog for the most recent period (from 1964 to 1992) and its prolongation up to 1997. Hence, the proposed activities on this topic will include:

- i) The update the list of significant earthquakes ( $M > 4.0$ ) from 1964 to 1997 on the basis of the revised instrumental catalog (CSTI).
- ii) Revision of the data of the Macroseismic Bulletin of the INGV from 1964 to 1997.
- iii) The re-computation of macroseismic parameters of earthquakes from 1964 to 1997 on the basis of the INGV Macroseismic Bulletin.
- iv) The publication of the update on the WEB.

In this Task we also propose some propaedeutical investigations, to be carried on in collaboration with the research company SGA, regarding the development of the code Boxer (Gasperini et al., 1999) used to estimate the parameters of historical earthquakes. We also will approach, still in collaboration with the research company SGA, the problem of objective evaluation of seismic intensity by the “Fuzzy sets” algorithm already applied in the past to the earthquakes of 1919 in Mugello and 1920 in Garfagnana (Ferrari et al., 1995, Vannucci et al., 1999). The results will be compared with standard

estimates in order to verify the real decisional procedures followed by macroseismic experts. In particular we propose:

- i) The improvement of the Boxer using the bilinear attenuation law proposed by Gasperini (2001).
- ii) The development of new methods to compute epicenter for offshore earthquakes.
- iii) The development of robust techniques to estimate the source depth.
- iv) The application of the Fuzzy algorithm to some strong Italian earthquakes.

To perform such investigations we request the activation of a **two-year research grant** for a temporary position attending this topics **part-time**, as some of the participants are not financially supported for the entire duration of the project. **Special funds are also requested (under voice “external services”) to allow the participation of the private research company SGA (Storia Geofisica Ambiente, Bologna).** The requested funds are also required to cover expenses for consumable materials, computing (one PC), publication and participation to scientific meetings. The expected products are:

### **I Year**

- Preliminary update of the CPTI for the period from 1964 to 1997 on the basis of the current computational methods.
- New release of the Boxer code to compute location magnitude and orientation of seismic sources from macroseismic data.
- Application of the Fuzzy Set algorithm to evaluate the intensities of the 1930 Irpinia earthquake

### **II Year**

- Definitive update of the CPTI for the period from 1964 to 1997 on the basis of upgraded methods.
- New release of the Boxer code including offshore location and depth computation.
- Application of the fuzzy set evaluation to at least other 3 strong earthquakes of the XX century.

### **Costs**

<b>Category</b>	<b>I year(Euro)</b>	<b>II year (Euro)</b>
Durable material	2500	

Consumables and other general costs	3000	3000
Travel and subsistence	2000	2000
Contracts and/or fellowships	7500	7500
Meetings and Congresses		
External services	15000	15000
Publications		2500
Other costs		
<b>Total</b>	30000	30000

Task 6C, INTENSITY TOMOGRAPHY AND SITE EFFECTS (Responsible: Gasperini, Collaborators: Albarello, Bernardini, Camassi, Carletti, Ercolani, Lolli, Mucciarelli, Vannucci)

In the first year of the project we have completed the first phase of this task, presently submitted for publication on an international journal (Carletti & Gasperini, 2002), consisting in the imaging of the lateral variations intensity attenuation coefficients of the bilinear law proposed by Gasperini (2001). We have verified by checkerboard and restore tests the ability of the macroseismic data set (about 20000 intensity observations) to reliably constrain the lateral variation of the intensity attenuation coefficients. The analysis of the empirical locality residuals has shown a clear reduction of the sizes and a more uniform spatial distribution with respect to an isotropic attenuation function. Moreover we found that the areas with highest attenuation in the near-field ( $D < 45$  km) almost exactly correspond to the ones where the heat-flow is also highest (Tyrrhenian slope of northern Apennines and volcanic areas of Campi Flegrei and Mt. Etna). This analysis suggested some improvement and refinement that we propose to carry out in the next two years, within the present task. We also include in this task the continuation of a study, already started up in the first year (Boccaletti et al., 2001), in which we have developed an original method to map the lateral variation of macroseismic intensity inside urban centers for which detailed technical reports on the effects induced by relatively recent earthquakes are available (*i.e.* Florence for the 1895 earthquakes). Hence the proposed investigations for the two-year program include:

- i) The detailed comparison of locality empirical residual with the lithological and topographical characteristics of sites in order to verify whether they are actually linked to specific local properties of the sites rather than to the uncertainties in the determination of intensity.

- ii) Introduction of the seismic source spatial orientation in the bilinear attenuation equation in order to make more realistic and precise the computation of distances. This can be done both using the Boxer technique (Gasperini *et al.*, 1999) or computing, simultaneously to the tomographic inversion, the orientation of sources that minimize the equation residuals.
- iii) Extension of the intensity dataset by the inclusion of the new data coming from the INGV macroseismic Bulletin of years 1993 to 1997.
- iv) Continuation of the study (Boccaletti *et al.*, 2001) on the lateral variations of intensity felt in the historical center of Florence on occasion of the 1895, Impruneta earthquakes and comparison with results of 1D simulation of ground motion and with soil amplification measures
- v) Application of the methods to other historical centers (i. e. Bologna for the 1929 earthquake).

To complete such investigations we request the activation of a **two-year research grant** to support a temporary position attending this topics **full-time** as, even in this case, some of the participants are not financially supported for the entire duration of the project. The requested funds also concern expenses for consumable materials, computing (one PC), publication and participation to scientific meetings.

The investigations on the above listed points will proceed mainly in parallel during the two years of the project. However point iii) will be completed in the first months of the first year as well as the first results of points ii) and iv) will be available at the end of first year. The expected products are:

### **I Year**

- Database of the lithological and topographical characteristics of the localities having felt reports for more than 10 different earthquakes, basing on the data used for the first tomographic inversion presently submitted for publication.
- Integrated macroseismic database including the data from the INGV macroseismic bulletin for all the events with  $I_{max} > V$ .
- Preliminary tomographic inversion using the updated database.
- Introduction of the spatial extension of the sources in attenuation computations.
- Study of the lateral variations of the intensity in Florence for the earthquakes of 1895 compared with 1D simulations of ground motion.

### **II Year**

- Database of the lithological and topographical characteristics of the localities having felt reports for more than 5 different earthquakes, basing on data used for the new tomographic inversion.
- Definitive tomographic inversion using the updated methods.
- Comparison of the lateral variations of the intensity in Florence with measures of soil amplification.
- Study of the lateral variation of intensity for other historical centers.

### Costs

Category	I year(Euro)	II year (Euro)
Durable material	3000	
Consumables and other general costs	2000	2000
Travel and subsistence	2000	2000
Contracts and/or fellowships	15000	15000
Meetings and Congresses		
External services		
Publications		3000
Other costs		
<b>Total</b>	<b>22000</b>	<b>22000</b>

### Other activities, already started up in the fist year, to be considered with priority

Task 5 – STATISTICS OF SEISMIC SOURCES AND CATALOG COMPLETENESS (Responsible: Marzocchi, Collaborators: Albarello, Dal Forno, D’Amico, Faenza, Gasperini, Lolli, Mucciarelli, Sandri, Selva, Vannucci)

Most of the participants to this task had already investigated on these topics in last years. Among the others we can mention the statistical studies on the earthquake time occurrence both at long (Boschi et al, 1995, Mulargia & Gasperini, 1995) and short time-scales (Gasperini and Mulargia, 1989, Lolli and Gasperini, 2002), the studies on the magnitude distribution properties (Marzocchi and Sandri, 2002), on the spatial distribution of earthquakes in Italy (Mulargia et al, 1987), on the statistics of felt intensity at the site (D’Amico e Albarello, 2002) and on the completeness of historical catalogs (Albarello et al., 2001).

The aim of this Task is to analyze the available seismological data (seismic catalogs, focal mechanisms, macroseismic fields, etc.) and to design specific experiments to verify the various hypotheses and theories on earthquake occurrence that has been proposed in the literature, as well as the ones that could issue from the research itself. We intend to study the modalities of the earthquake occurrence

- i) in space (seismogenic model)
- ii) in time (statistical occurrence models)
- iii) in energy (scaling law)
- iv) in ground motion amplitude at site (attenuation law and local effects)

This task will also take advantage of some propaedeutical activities, developed in other Tasks (mainly 1 and 7), concerning the improvement of the seismological database. We request the activation of a **two-year research grant** for a temporary position attending **part-time** to these topics. The requested funds also concern expenses for consumable materials, computing (one PC), publication and participation to scientific meetings.

Even for this Task the investigations on the above listed points will proceed mainly in parallel during the two years of the project. The expected products at the **end of the biannual** program are:

- Spatial seismic occurrence model relative to both the historical (long time-scale) and instrumental (short time-scale) seismicity.
- Statistical time occurrence model and its calibration on instrumental data.
- Verification of the magnitude scaling law for the instrumental catalog.
- Verification of the seismic attenuation law currently in use.
- Statistical model for the time series of the intensity felt at the site.

**Costs**

<b>Category</b>	<b>I year(Euro)</b>	<b>II year (Euro)</b>
Durable material	3000	
Consumables and other general costs	2000	2000
Travel and subsistence	4000	4000

Contracts and/or fellowships	7500	7500
Meetings and Congresses		
External services		
Publications		3000
Other costs		
<b>Total</b>	16500	16500

Task 7, FOCAL MECHANISMS (Responsible: Morelli, Collaborators: Dal Forno, Gasperini, Lolli, Pondrelli, Vannucci)

As already mentioned in the introductory statement, we intend to continue the already started activities (two papers have been recently submitted and a third one is currently in press) concerning the database of first motion mechanism of the Mediterranean area (Vannucci and Gasperini, 2002; Gasperini and Vannucci, 2002) and the computation of regional CMT solutions (Pondrelli et al., 2002). We also intend to approach further studies, based on the collected data, devoted to the characterization and the numerical modeling of the stress and deformation fields in the Italian area. The proposed activities are:

- i) Insertion in the database of further mechanisms coming from other published papers.
- ii) Improvements of the database management software, including some new procedures in the MS-ACCESS application like that the plot of the mechanism and the in-line checking of inserted mechanisms.
- iii) Availability on the WEB of a reduced version of the first motion solution database.
- iv) Computation of new RCMT mechanisms.
- v) Analysis of cumulative moment tensor (Kostrov, 1974) and of compatibility of stress directions (Gephart & Forsyth, 1984) for various zones of the Mediterranean area.

The requested funds mainly concern expenses for consumable materials, computing, publication and participation to scientific meetings. The expected products **in both years** are:

- Update of the database of the focal mechanism.
- Update of the catalog of regional CMT.
- Spatial distribution analysis of the of stress and strain tensors in Italy and surrounding regions.

## Costs

<b>Category</b>	<b>I year(Euro)</b>	<b>II year (Euro)</b>
Durable material		
Consumables and other general costs	3000	3000
Travel and subsistence	3000	3000
Contracts and/or fellowships		
Meetings and Congresses		
External services	2000	2000
Publications		
Other costs		
<b>Total</b>	<b>8000</b>	<b>8000</b>

## **Priority 2**

### **Activities already started up in the first year but not considered with priority by the Commission**

Task 9A, GEODETIC MEASUREMENTS (Responsible Anzidei: Collaborators: Baldi, Casula, Cenni, Del Mese, Galvani, Gandolfi, Giovani, Loddo, Massucci, Pesci, Riguzzi, Serpelloni, Vecchi, Vittuari, Zanutta)

As indicated in the introductory statement, these activities are re-proposed, even if not in full agreement with the suggestion of the referees, as we believe that other investigations on this topic, currently in course within other GNDT projects, do not adequately approach the geodetic assessment of interseismic deformation. The proposed program includes the choice and installation of about 10 GPS semi-permanent sites in central and southern Italy, the execution of 2/3 measurement campaigns at a semi-annual rate as well as the elaboration of the resulting data to compute the time behavior of the strain field.

The costs concern mainly the logistic supplies of semi-permanent sites, the recognition surveys and measurement campaigns, the maintenance of already available GPS receivers and/or the purchase of 1/2 new GPS receivers, besides the expenses for consumable materials, computing, publication and participation to scientific meetings. The expected products are:

#### **I Year**

- Installation of 4-6 new semi-permanent stations.
- A measurement campaign covering the newly installed stations.

#### **II Year**

- Installation 4-6 new semi-permanent stations.
- 1/2 measurement campaign covering the set of newly installed stations.
- Strain tensors among the campaigns.

## Costs

<b>Category</b>	<b>I year(Euro)</b>	<b>II year (Euro)</b>
Durable material	40000	3000
Consumables and other general costs	6000	10000
Travel and subsistence	5000	15000
Contracts and/or fellowships		
Meetings and Congresses		
External services	5000	10000
Publications		3000
Other costs		
<b>Total</b>	<b>56000</b>	<b>41000</b>

### Priority 3

#### Activities not started in the first year, to be carried on in collaboration with the Amato's Project

Task 2, INSTRUMENTAL SEISMIC CATALOG (Responsible Gasperini, Collaborators: Albarello, DeSimoni, Lolli, Marzocchi, Monachesi, Sandri, Vannucci)

On this topic we propose the continuation of the investigations, performed in the ambit of the GNDT Project 1998, that brought to the formulation of a new procedure to homogeneously re-evaluate the local magnitude in Italy (Gasperini, 2002) and to the publication of the CSTI catalog (CSTI Working Group, 2001). We also intend to investigate on the causes of the bias, observed in the World catalog (Perez, 1998), on surface wave magnitude  $M_s$  calibration, before and after the installation of the WWSSN network in 1964 and also observed in Italy from the comparison between instrumental and macroseismic magnitudes. The main objectives concern:

- i) Extension of the local magnitude re-valuation to years before 1981 and after 1996 (not included in CSTI).
- ii) Estimate of new magnitude attenuation relations differentiated spatially.
- iii) Re-reading of Wood-Anderson seismograms made available by the SISMOS project of INGV.
- iv) Study of the temporal variation of the calibration of the seismic stations of the RSNC.
- v) Investigation on the procedures and instruments used to compute  $M_s$  before the WWSSN.

The funds, beside the current expenses, are requested for **a part-time research grant**. The expected products are:

#### I Year

- Magnitude attenuation relations spatially differentiated for the Adriatic and Tyrrhenian areas
- Re-reading of Wood-Anderson amplitudes for at least 200 earthquakes

#### II Year

- Magnitude attenuation relations spatially differentiated for more circumscribed areas.

- Re-valuation of local magnitudes from 1997 to 2002 and from 1976 to 1980.
- Temporal behavior of station corrections from 1976 to 2002
- Preliminary revaluation of Ms for the Italian catalog.

### Costs

<b>Category</b>	<b>I year(Euro)</b>	<b>II year (Euro)</b>
Durable material		
Consumables and other general costs	1500	1500
Travel and subsistence	1000	1000
Contracts and/or fellowships	7500	7500
Meetings and Congresses		
External services		
Publications		
Other costs		
<b>Total</b>	10000	10000

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Baldi Paolo	Full Professor	Univ. Bologna	1+1
Bernardini Filippo	Researcher	INGV Bologna	3+3
Camassi Romano	Researcher	INGV Bologna	2+2
Carletti Francesca	PHD Student	Univ. Bologna	4+4
Castelli Viviana	Researcher	INGV Macerata	1+1
Casula Giuseppe	Researcher	INGV Bologna	1+1
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Faenza Licia	PHD Student	Univ. Bologna	2+2
Gandolfi Stefano	Research grant holder	INGV Bologna	1+1
Gasperini Paolo	Associate Professor	Univ. Bologna	6+6
Guidi Cristiano	Technician	Univ. Bologna	1+1

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Morelli Andrea	Researcher	INGV Roma	1+1
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Pondrelli Silvia	Researcher	INGV Bologna	2+2
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32+SGA			73+73

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Giovani Luciano	Technician	INGV Roma	2+2
Massucci Angelo	Technician	INGV Roma	2+2
Riguzzi Federica	Researcher	INGV Roma	1+1
Vecchi Maurizio	Technician	INGV Roma	2+2
7			14+14

## Summary of funding requests

<b>Tasks</b>	<b>I year(Euro)</b>	<b>II year (Euro)</b>
<b>Priority 1</b>		
1, HISTORICAL SEISMIC CATALOG	30000	30000
6C, INTENSITY TOMOGRAPHY AND SITE EFFECTS	22000	22000
5, STATISTICS OF SEISMIC SOURCES AND CATALOG COMPLETENESS	16500	16500
7, FOCAL MECHANISMS	8000	8000
<b>Total</b>	76500	76500
<b>Priority 2</b>		
9A, GEODETIC MEASUREMENTS ( <b>Research Unit INGV</b> )	56000	41000
<b>Priority 3</b>		
2, INSTRUMENTAL SEISMIC CATALOG	10000	10000
<b>Full Total</b>	142500	127500