Annex C.4.3.a- Work Package Description (WPD)

WP no.	1			
WP title	*New libraries devoted to numerical, symbolic computation and algebraic programming methods in space science and applications*			
WP responsible organization (CO/P)	CO			
WP responsible person	Dumitru Vulcanov			
Involved partners	CO	P1	P2	Total
Person-months	14	2	2	18
Start month	month 1			
End month	month 18			

Objective(s)

- Development of alternative gravity theories in certain astrophysical processes.
- Investigating and pointing out of measurable effects in different types of scattered/produced radiation in cosmic environment.

Description of work and role of participants

Task 1.1: Investigations on measurable effects of alternative gravity theories for non-standard cosmologies (CO, P1).

Task 1.2: Investigating the scattering processes on different types of black holes using computational methods (CO, P2).

INPUTS to the WP

- Personal competences of the research team.
- Computing facilities and other existing research infrastructure.
- Theoretical models for modified gravity theories.
- Standard computer algebra libraries (COSMO, GRTensorII, etc).
- Scientific software packages for cosmology.

OUTPUTS to the WP

- New models and procedures for investigating general relativity and cosmology.
- Testable cosmological predictions of selected modified gravity theories.
- Software packages (numerical, symbolical and graphical) for applications in space sciences.

Deliverables

D.1.1: Report on alternative gravity theories for non-standard cosmologies – Month 12.
D.1.2: 3 papers in ISI journals and 2 Conference papers on measurable effects in alternative theories of gravity – Months 8-18.
D.1.3: Software package (including user guide) for computational processing in general relativity and cosmology – Month 16.

WP no.	2			
WP title	**Modeling of nonlinear phenomena and estimations in spatial dynamics**			
WP responsible organization (CO/P)	**P1**			
WP responsible person	**Lungu Mihai**			
Involved partners	CO	P1	P2	Total
Person-months	**2**	**14**	**2**	**18**
Start month	month 1			
End month	month 18			
Objective(s)				

- Development of new mathematical tools for investigating spatial nonlinear phenomena.
- Design of new reduced-order multiple observers with applications to the flight of spacecraft.

Description of work and role of participants

Task 2.1: Nonlinear dynamics generated by gravitational models (P1, CO).

Task 2.2: Analytical and computational investigation of nonlinear equations describing turbulent phenomena - including solar wind (P1, P2).

Task 2.3: Design, software implementation and validation of reduced-order multiple observers for Takagi-Sugeno nonlinear systems with/without unknown inputs (P1).

INPUTS to the WP

- Personal competences of the research team.
- Computing facilities and other existing research infrastructure.

OUTPUTS to the WP

- New models and procedures for investigating of spatial dynamics.
- Software package for the design of reduced-order multiple observers.

Deliverables

D.2.1: Report on chaos control of the dynamics of turbulent media – Month 10.
D.2.2: 3 papers in ISI journals and 3 BDI conference papers on gravitational model, on turbulent cosmic phenomena and on the design of reduced-order multiple observers – Months 8-18.
D.2.3: Technical documentation and product (software package) on the new method for the design of reduced-order multiple observers – Month 18.

WP no.	3			
WP title	The relevance of Kelvin-Helmholtz instability in the solar partially ionized plasma structures			
WP responsible organization (CO/P)	P2			
WP responsible person	Alexandru Marcu			
Involved partners	CO	P1	P2	Total
Person-months	2	2	14	18
Start month	month 1			
End month	month 18			

Objective(s)

- Prediction of the occurrence of unstable Kelvin-Helmholtz instabilities (dissipative instabilities or negative energy waves) in solar plasma lower flow rates, and the manner in which the Kelvin-Helmholtz instabilities are influenced by the ions-electrons and neutral frequency collisions.

- Obtaining of the bulk transport properties of plasma through a statistical approach based on solving the stochastic differential equations associated to the motion of each particle, charged or neutral

Description of work and role of participants

Task 3.1: Obtaining the theoretical tool to predict the occurrence of unstable Kelvin-Helmholtz instabilities (dissipative instabilities or negative energy waves) in solar plasma with lower flow rates, and the manner in which the Kelvin-Helmholtz instabilities are influenced by the ion and neutral frequency collisions (P2).

Task 3.2: Obtaining the bulk transport properties of plasma through a statistical approach based on solving the stochastic differential equations associated to the motion of each particle, charged or neutral (P2, CO).

Task 3.3: Numerical simulations by implementation of the proposed algorithm and the identification of the space of parameters that characterizes the output of the simulation (P2, P1).

INPUTS to the WP

- General description of the MHD two-fluid model for Kelvin–Helmholtz instability.

- General description of the system configuration.

- Parameter space from observational data.

OUTPUTS to the WP

- The general form of the dispersion equation.

- Algorithm and simulations concerning the evolution of plasma transport properties in solar configurations.

Deliverables

D.3.1: Technical documentation on the new algorithm (method) needed to produce an analyze unstable solutions and the new algorithm (method) needed to produce the solutions of the stochastic differential equations associated to the motion of each particle, charged or neutral and general forms of unstable solutions – Month 12.

D.3.2: 1 paper in ISI journals and 2 BDI conference papers on theories and models about the onset of KH instabilities in solar plasmas structures – Months 8-18.

D.3.3: Technical documentation and product (software package) on simulations concerning the evolution of plasma transport properties in solar configurations – Month 18.

WP no.	4			
WP title	Dissemination and communication / Training and education			
WP responsible organization (CO/P)	P1/P2			
WP responsible person	Radu Constantinescu / Alexandru Marcu			
Involved partners	CO	P1	P2	Total
Person-months	1	2	2	5
Start month	month 5			
End month	month 18			

Objective(s)

- Promote knowledge on space science and on ESA and ROSA Programs.
- Encouraging researchers to participate in international activities, programs and conferences.
- Publishing research results.
- Establish high-level collaborative environment within the COMASS participants.

Description of work and role of participants

Task 4. 1: Organization of public events for promoting space science, its social and economic importance, as well as the ESA and ROSA Programs (Month 4 - P1; Month 10 - CO, Month 16 - P2).

Task 4.2: Spreading information on the main conferences, and project calls on Space science among the COMASS Participants (CO).

Task 4.3: Periodical meetings of the research teams for presenting up-to-date scientific results in view of their publication. (CO, P1, P2 - Months 4, 10, 11, 16, 17).

INPUTS to the WP

- Experiences of the partners in promoting sciences and science education.
- Previous cooperation among partners in organizing conferences and events devoted to space science.
- Financial support of the project for editing printed and media materials on space science.
- The existent infrastructure and equipment for space observation.

OUTPUTS to the WP

- Increased interest of young people for space science.
- Formation of groups of volunteer students in the three involved universities who will act for space science promotion.
- Enhanced awareness of the large public on the main issues on space security.

Deliverables

D.4.1: Documents (leaflets, posters and other printed materials) on space sciences – Months 6, 12, 18.
D.4.2: Document (booklet) addressed to socio-economic environment (public and private institutions) on the results of the COMASS project – Month 17.
D.4.3: Web-site of the COMASS project (initiation and update) – Months 3-18.
D.4.4: Mass media documents with TV broadcast on the project – Months 1-18.
D.4.5: Series of transversal and interdisciplinary lectures on Cosmology and Space Technology – Months 2-6, 8-11.

WP no.	5			
WP title	Management and administration			
WP responsible organization (CO/P)	CO			
WP responsible person	Dumitru Vulcanov			
Involved partners	CO	P1	P2	Total
Person-months	2	1	1	4
Start month	month 1			
End month	month 18			

Objective(s)

- ensure coordination of activities within the project
- managing the research activities of the project
- ensure the intra consortium and external relationship of the team working within the project
- managing the equipment necessary for the research and administration activities
- managing the project budget

Description of work and role of participants

Within this work package will be ensured the management of the project during its development on project lifetime. This activity is subdivided in 3 tasks that will manage the entire administrative domain.

Task 5.1: Establish the rules and procedures for the project activities. Nomination of the administration structure of the project (main responsibilities): Project Management → CO, Dissemination and communication → P1, Training and education → P2.

Task 5.2: Coordination of activities within the project: Coordination of Executive Committee → CO, Workshops' organization → P1, Conferences' organization → P2.

Task 5.3: Internal and external communication and administration of the COMASS budget → CO.

INPUTS to the WP

- Previous cooperation among partners.
- The rules and regulations agreed in the cooperation agreement, as well as the customs established within the previous cooperation.

OUTPUTS to the WP

- Smooth and efficient completion of the staff involved in research and educational activities.
- Documents which establish how information and the intellectual property rights are shared among partners.

Deliverables

D 5.1: Decision on the administrative structure of the project (CO, P1, P2) – Month 1.
D 5.2: Publication of the rules and procedures (CO) – Month 2.
D 5.3: Adoption of COMASS work program (CO, P1, P2) – Month 1.
D 5.4: Elaboration of the scientific and financial reports (CO, P1, P2) – Month 18.