

## **Table of contents**

<i>a. Abstract</i>	<i>i-v</i>
<i>b. Declaration</i>	<i>vi</i>
<i>c. Certificate</i>	<i>vii</i>
<i>d. Acknowledgements</i>	<i>ix</i>
<i>e. Table of contents</i>	<i>x-xiv</i>
<i>f. List of tables</i>	<i>xv</i>
<i>g. List of figures</i>	<i>xvi-xxii</i>
<i>h. List of abbreviations</i>	<i>xxiii-xxiv</i>
<i>i. List of symbols</i>	<i>xxv-xxvi</i>

### **CHAPTER-1** **[1-16]**

#### **An overview of self-gravitating dusty plasmas: dust molecular clouds**

<i>Abstract</i>	1
1.1 Introduction	1
1.2 Physical properties of the dust	1-3
1.3 Dust charging mechanisms	3-7
1.4 Jeans instability and star formation	7-11
1.5 Types of molecular clouds	11-13
1.6 Motivation	13-14
1.7 Objectives	15
<i>References</i>	15-16

### **CHAPTER-2** **[17-36]**

#### **Electromagnetic characterization of a dust molecular cloud**

<i>Abstract</i>	17
2.1 Introduction	17-19
2.2 Physical model	19-20
2.3 Mathematical analyses	20-24
2.4 Results and discussions	24-32
2.5 Conclusions	33-34

<i>References</i>	34-36
<b>CHAPTER-3</b>	<b>[37-74]</b>
<b>Non-local linear stability analysis of self-gravitating charged dust sphere</b>	
<i>Abstract</i>	37
3.1 Introduction	37-40
3.2 Physical model	40-41
3.3 Basic governing equations	41-42
3.4 Derivation of stability mass limit	42-43
3.5 Non-local fluctuation analysis	43-56
3.5.1 <i>Electrostatic Fluctuations</i>	44-52
3.5.2 <i>Self-gravitational Fluctuations</i>	52-56
3.6 Results and discussions	56-70
3.7 Conclusions	70-72
<i>References</i>	72-74
<b>CHAPTER-4</b>	<b>[75-88]</b>
<b>New nonlinear eigenmode patterns in spherical charged dust molecular cloud</b>	
<i>Abstract</i>	75
4.1 Introduction	75-76
4.2 Physical model	76-78
4.3 Basic governing equations	78-79
4.4 Derivation of $m$ -KdVB equation	79-81
4.5 Results and discussions	81-86
4.5.1 <i>Comperative Results</i>	84-86
4.6 Conclusions	86-87
<i>References</i>	87-88
<b>CHAPTER-5</b>	<b>[89-110]</b>
<b>Pulsational mode fluctuations and basic conservation laws</b>	
<i>Abstract</i>	89
5.1 Introduction	89-90

5.2 Physical model	90-92
5.3 Mathematical formulation	92-95
5.4 Conservation laws	96-99
5.4.1 <i>Conservative forms of Electrostatic KdV Dynamics</i>	96-97
5.4.2 <i>Conservative forms of Self-gravitational KdV Dynamics</i>	97-99
5.5 Results and discussions	99-107
5.5.1 <i>Electrostatic Fluctuations</i>	99-102
5.5.2 <i>Self-gravitational Fluctuations</i>	103-105
5.5.3 <i>Comparative Fluctuations</i>	105-107
5.6 Conclusions	108-109
<i>References</i>	109-110

**CHAPTER-6** **[111-134]**

**Global pulsational mode fluctuations in inhomogeneous dust molecular cloud with dust-charge variation**

<i>Abstract</i>	111
6.1 Introduction	111-114
6.2 Physical model	114-115
6.3 Basic governing equations	115-118
6.4. Derivation of nonlinear equations	118-122
6.4.1 <i>Derivation of Electrostatic d-KdV Equation</i>	118-120
6.4.2 <i>Derivation of Self-gravitational d-KdV Equation</i>	120-122
6.4.3 <i>Stationary Evolution Equations</i>	122
6.5 Results and discussions	122-129
6.5.1 <i>Electrostatic Fluctuations</i>	122-126
6.5.2 <i>Self-gravitational Fluctuations</i>	126-129
6.6 Conclusions	129-132
<i>References</i>	132-134

**CHAPTER-7** **[135-149]**

**Gravitational fluctuations in self-gravitationally confined solar plasma**

<i>Abstract</i>	135
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7.1 Introduction	135-137
7.2 The model	137-138
7.3 Basic normalized set of equations	138-139
7.4. Derivation of $d$ -KdVB equation	139-141
7.5 Results and discussions	141-146
7.5.1 <i>Analytical Results</i>	141-143
7.5.2 <i>Numerical Results</i>	143-145
7.5.3 <i>Comparative Results</i>	145-146
7.6 Conclusions	146-148
<i>References</i>	148-149

**CHAPTER-8 [150-183]**

**Atypical nonlinear waves in a self-gravitating collisional dusty plasma with active ion-inertia**

<i>Abstract</i>	150
8.1 Introduction	150-153
8.2 Physical model	153-154
8.3 Mathematical analyses	154-166
8.3.1 <i>Governing Equations</i>	154-156
8.3.2 <i>Application of Multi-scale Analysis</i>	156-161
8.3.3 <i>Application of the Sagdeev pseudo-potential Method</i>	161-166
8.4 Results and discussions	166-178
8.4.1 <i>Weakly Nonlinear Fluctuations</i>	167-172
8.4.2 <i>Strongly Nonlinear Fluctuations</i>	172-178
8.5 Conclusions	178-181
<i>References</i>	181-183

**CHAPTER-9 [184-186]**

**Conclusions and future directions**

**APPENDIX-A [187-188]**

**Nonlinear pulsational eigenmodes of a collisional dust molecular cloud**

<b>APPENDIX-B</b>	<b>[189-190]</b>
<b>New oscillatory fluctuation patterns in solar plasma</b>	
<b>SUMMARY OF MINOR ACHIEVEMENT</b>	<b>191</b>
<b>LIST OF PUBLICATIONS</b>	<b>192-193</b>

## List of tables

<i>Chapter No</i>	<i>Table No</i>	<i>Table caption</i>	<i>Page No</i>
1	1.1	<i>Physical properties of interstellar dust grains</i>	3
2	2.1	<i>Normalization constants with estimated typical values</i>	25
	2.2	<i>Estimated values of electromagnetic parameters</i>	32
3	3.1	<i>Normalization constants with estimated typical values</i>	57
4	4.1	<i>Our analysis versus existing analyses</i>	84-86
5	5.1	<i>Electrostatic and self-gravitational fluctuations</i>	106-107
8	8.1	<i>Comparison between our model and existing model analyses</i>	175-178

## List of figures

<b>Chapter No</b>	<b>Figure No</b>	<b>Figure caption</b>	<b>Page No</b>
1	1.1	<i>Schematic diagram of the morphological shape of a spherical dust grain at normal temperature (<math>T_n</math> K) in interstellar space. All the concentric shielding layers, composed of different chemical substances, get evaporated and ionized at plasma temperature (<math>T_p</math> K <math>\gg T_n</math> K), leaving behind only the dust core electrically charged in the space.</i>	3
	1.2	<i>Schematic diagram of a normal spherical DMC.</i>	8
2	2.1	<i>Profile of the normalized values of (a) electric potential (blue line), (b) potential gradient (red line), (c) potential scale-length (green line), and (d) potential curvature (black line) with normalized position. Various input and initial parameter values are presented in the text.</i>	26
	2.2	<i>Profile of the normalized electric potential with normalized position under the same condition as figure 2.1.</i>	26
	2.3	<i>Profile of the normalized values of (a) electric field (blue line), (b) field divergence (red line), (c) field scale-length (green line), and (d) field curvature (black line) with normalized position under the same condition as figure 2.1.</i>	29
	2.4	<i>Profile of the normalized values of (a) electric pressure (blue line), (b) pressure gradient (red line), (c) pressure scale-length (green line), and (d) pressure curvature (black line) with normalized position under the same condition as figure 2.1.</i>	29
	2.5	<i>Profile of the normalized values of (a) electric energy (blue line), (b) energy gradient (red line), (c) energy scale-length (green line), and (d) energy curvature (black line) with normalized position under the same condition as figure 2.1.</i>	31
3	3.1	<i>Schematic diagram of the spherical DMC considered in the analysis. Various concentric spherical layers are described in the text.</i>	43

- 3.2 *Profile of the normalized electrostatic potential fluctuations  $(\tilde{\theta}_1(\xi))$  with variation in normalized distance  $(\xi)$  and in normalized wave vector  $(k)$  of the fluctuations. Various input and initial parameter values are given in the text.* 58
- 3.3 *Profile of the normalized (a) real part of frequency, (b) imaginary part of frequency, and (c) imaginary-to-real frequency ratio of the fluctuations with variation in normalized distance  $(\xi)$  and in normalized wave vector  $(k)$ . Different input and initial parameter values used are the same as figure 3.2.* 59
- 3.4 *Same as figure 3.3, but in the large wavelength regime  $(k \rightarrow 0)$ .* 60
- 3.5 *Same as figure 3.3, but in the small wavelength regime  $(k \rightarrow \infty)$ .* 61
- 3.6 *Profile of the normalized (a) phase velocity, and (b) group velocity of the fluctuations with variation in normalized distance  $(\xi)$  and in normalized wave vector  $(k)$ . The different input and initial parameter values used are same as figure 3.2.* 62
- 3.7 *Spatial profile of the real part (A, B, C, D) and imaginary part (a, b, c, d) of the  $\theta(\xi)$ -fluctuation frequency with variation in (a)  $Z_d$  and (b)  $m_d$ , correspondingly, under the same condition as figure 3.2. Different lines in (a) correspond to  $Z_d = 100$  (blue), 102 (red), 104 (green), and 106 (black), respectively. Again, different lines in (b) link to  $m_d = 2.49 \times 10^{-14}$  (blue),  $2.50 \times 10^{-14}$  (red),  $2.51 \times 10^{-14}$  (green), and  $2.52 \times 10^{-14}$  kg (black), respectively.* 62
- 3.8 *Profile of the normalized self-gravitational potential fluctuations  $(\tilde{\eta}_1(\xi))$  with normalized distance  $(\xi)$  and in normalized wave vector  $(k)$  of the fluctuations. Various input and initial parameter values are given in the text.* 64
- 3.9 *Profile of the normalized (a) real part of frequency, (b) imaginary part of frequency, (c) imaginary part of frequency with different orientation, and (d) imaginary-to-real frequency ratio of the fluctuations with normalized distance  $(\xi)$  and in* 66



		<i>normalized wave vector (<math>k</math>). The different input and initial parameter values used are the same as figure 3.8.</i>	
	3.10	<i>Same as figure 3.9, but in the large wavelength regime (<math>k \rightarrow 0</math>).</i>	67
	3.11	<i>Same as figure 3.9, but in the small wavelength regime (<math>k \rightarrow \infty</math>).</i>	68
	3.12	<i>Profile of the normalized (a) phase velocity, and (b) group velocity of the fluctuations with normalized distance (<math>\xi</math>) and in normalized wave vector (<math>k</math>). The different input and initial parameter values used are the same as figure 3.8.</i>	69
	3.13	<i>Same as figure 3.7, but now for the <math>\eta(\xi)</math>-fluctuations. The different input and initial values used are the same as figure 3.8.</i>	70
4	4.1	<i>Cartoon showing a typical spherical DMC model.</i>	77
	4.2	<i>Profile of the normalized lowest-order perturbed self-gravitational (a) potential (b) potential gradient, (c) potential curvature, and (d) phase portrait. Various lines correspond to Case (1): <math>m_d = 1.02 \times 10^{-14}</math> kg (blue line), Case (2): <math>m_d = 1.07 \times 10^{-14}</math> kg (red line), Case (3): <math>m_d = 1.11 \times 10^{-14}</math> kg (green line), and Case (4): <math>m_d = 1.14 \times 10^{-14}</math> kg (black line), respectively. Various input and initial values are given in the text.</i>	83
5	5.1	<i>Schematic diagram showing a partially ionized DMC model.</i>	91
	5.2	<i>Profile of the normalized lowest-order perturbed electrostatic (a) potential, (b) field, (c) potential curvature, and (d) phase portrait. Various lines correspond to Case (1): <math>m_d = 2.741 \times 10^{-12}</math> kg (blue line), Case (2): <math>m_d = 2.754 \times 10^{-12}</math> kg (red line), Case (3): <math>m_d = 2.768 \times 10^{-12}</math> kg (green line), and Case (4): <math>m_d = 2.781 \times 10^{-12}</math> kg (black line), respectively. Various input and initial parameter values are given in the text.</i>	101
	5.3	<i>Profile of the first five conserved quantities of electrostatic KdV dynamics under the same condition as figure 5.2. Various lines correspond to Case (1): <math>P_{e1}</math> (blue line), Case (2): <math>P_{e2}</math> (red line),</i>	102

Case (3):  $P_{e3}$  (green line), Case (4):  $P_{e4}$  (black line), and Case (5):  $P_{e5}$  (pink line), respectively.

5.4 Profile of the normalized lowest-order perturbed self-gravitational (a) potential, (b) field, (c) potential curvature, and (d) phase portrait. Various lines correspond to Case (1):  $m_d = 4.30 \times 10^{-9}$  kg (blue line), Case (2):  $m_d = 1.79 \times 10^{-8}$  kg (red line), Case (3):  $m_d = 3.15 \times 10^{-8}$  kg (green line), and Case (4):  $m_d = 4.50 \times 10^{-8}$  kg (black line), respectively. Various input and initial parameter values are given in the text. 104

5.5 Profile of the first five conserved quantities of self-gravitational KdV dynamics under the same condition as figure 5.4. Various lines correspond to Case (1):  $P_{g1}$  (blue line), Case (2):  $P_{g2}$  (red line), Case (3):  $P_{g3}$  (green line), Case (4):  $P_{g4}$  (black line), and Case (5):  $P_{g5}$  (pink line), respectively. 105

6 6.1 Cartoon showing inhomogeneous, partially-charged DMC adopted in our investigation without any Jeans swindle included. The charging of the grains due to the electron, ion bombardments, ultraviolet radiation and photoelectric emission mechanisms is highlighted. 114

6.2 Spatial profile of the normalized lowest-order perturbed (a) electrostatic potential showing a unique dynamical transition from soliton to oscillatory shock-like structure, (b) electric field, (c) potential curvature, and (d) phase portrait due to cloud multi-parameter variation. Various lines correspond to Case (1):  $m_d = 7.00 \times 10^{-9}$  kg,  $n_{dco} = 5.00 \times 10^1$  m<sup>-3</sup>,  $n_{eo} = 1.00 \times 10^3$  m<sup>-3</sup>, and  $n_{io} = 7.00 \times 10^3$  m<sup>-3</sup> (blue line), Case (2):  $m_d = 6.30 \times 10^{-9}$  kg,  $n_{dco} = 7.33 \times 10^1$  m<sup>-3</sup>,  $n_{eo} = 6.60 \times 10^2$  m<sup>-3</sup>, and  $n_{io} = 7.50 \times 10^3$  m<sup>-3</sup> (red line), Case (3):  $m_d = 5.60 \times 10^{-9}$  kg,  $n_{dco} = 9.66 \times 10^1$  m<sup>-3</sup>,  $n_{eo} = 3.30 \times 10^2$  m<sup>-3</sup>, and  $n_{io} = 8.00 \times 10^3$  124

$m^{-3}$  (green line), and Case (4):  $m_d = 4.90 \times 10^{-9}$  kg,  $n_{dco} = 1.20 \times 10^2 m^{-3}$ ,  $n_{eo} = 1.00 \times 10^2 m^{-3}$ , and  $n_{io} = 8.50 \times 10^3 m^{-3}$  (black line), respectively. Various input and initial parameter values are presented in the text.

6.3 Spatiotemporal profile of the normalized lowest-order perturbed electrostatic potential evolving as (a) soliton-like structure, and (b) shock-like structure under same condition as figure 6.2. The boundary conditions and input values are presented in the text. 126

6.4 Spatial profile of the normalized lowest-order perturbed self-gravitational (a) potential showing a unique characteristic transition from soliton to oscillatory shock-like eigenmode structure, (b) field, (c) potential curvature, and (d) phase portrait due to cloud multi-parameter variation. Various lines correspond to Case (1):  $n_{io} = 8.00 \times 10^3 m^{-3}$ ,  $n_{dco} = 2.40 \times 10^{-1} m^{-3}$ ,  $n_{dno} = 4.30 \times 10^1 m^{-3}$ ,  $F_{ed} = 1.95 \times 10^3$ , and  $F_{id} = 1.47 \times 10^3$  (blue line), Case (2):  $n_{io} = 7.57 \times 10^3 m^{-3}$ ,  $n_{dco} = 2.43 \times 10^{-1} m^{-3}$ ,  $n_{dno} = 4.36 \times 10^1 m^{-3}$ ,  $F_{ed} = 1.9234 \times 10^3$ , and  $F_{id} = 1.413 \times 10^3$  (red line), Case (3):  $n_{io} = 7.14 \times 10^3 m^{-3}$ ,  $n_{dco} = 2.46 \times 10^{-1} m^{-3}$ ,  $n_{dno} = 4.43 \times 10^1 m^{-3}$ ,  $F_{ed} = 1.8968 \times 10^3$ , and  $F_{id} = 1.3568 \times 10^3$  (green line), and Case (4):  $n_{io} = 6.71 \times 10^3 m^{-3}$ ,  $n_{dco} = 2.50 \times 10^{-1} m^{-3}$ ,  $n_{dno} = 4.50 \times 10^1 m^{-3}$ ,  $F_{ed} = 1.87 \times 10^3$ , and  $F_{id} = 1.30 \times 10^3$  (black line), respectively. Various input and initial parameter values are given in the text. 128

6.5 Spatiotemporal profile of the normalized lowest-order perturbed electrostatic potential evolving as (a) soliton-like, and (b) shock-like structures under the same condition as figure 6.4. The boundary conditions and input initial values are given in the text. 129

7 7.1 Profile of the normalized lowest-order perturbed self-gravitational potential obtained analytically on a bounded scale 143

(SIP). Various lines correspond to Case (1):  $M_o = 1.00 \times 10^{-10}$  (blue line), Case (2):  $M_o = 3.00 \times 10^{-10}$  (red line), Case (3):  $M_o = 4.00 \times 10^{-10}$  (green line), and Case (4):  $M_o = 6.00 \times 10^{-10}$  (black line), respectively. Various input and initial parameter values are given in the text.

7.2 Profile of the normalized lowest-order perturbed self-gravitational (a) potential, (b) potential gradient, (c) potential curvature, and (d) phase portrait on a bounded scale (SIP). 144

Various lines correspond to Case (1):  $M_o = 1.50 \times 10^{-3}$  (blue line), Case (2):  $M_o = 4.50 \times 10^{-3}$  (red line), Case (3):  $M_o = 7.50 \times 10^{-3}$  (green line), Case (4):  $M_o = 10.50 \times 10^{-3}$  (black line), respectively. Various input and initial parameter values are given in the text.

8 8.1 Cartoon showing our considered DMC model. 154

8.2 Spatial profile of the normalized lowest-order perturbed electrostatic (a) potential, (b) field, (c) potential curvature, and (d) phase portrait. Various lines correspond to Case (1):  $n_{i_o} = 1.00 \times 10^3 \text{ m}^{-3}$  (blue line), Case (2):  $n_{i_o} = 1.10 \times 10^3 \text{ m}^{-3}$  (red line), Case (3):  $n_{i_o} = 1.20 \times 10^3 \text{ m}^{-3}$  (green line), and Case (4):  $n_{i_o} = 1.30 \times 10^3 \text{ m}^{-3}$  (black line), respectively. Various input and initial parameter values are presented in the text. 168

8.3 Spatiotemporal profile of the normalized lowest-order perturbed electrostatic potential under same condition as figure 8.2. The boundary conditions and input values are presented in the text. 169

8.4 Spatial profile of the normalized lowest-order perturbed self-gravitational (a) potential, (b) field, (c) potential curvature, and (d) phase portrait. Various lines correspond to Case (1):  $n_{i_o} = 1.00 \times 10^3 \text{ m}^{-3}$  (blue line), Case (2):  $n_{i_o} = 1.03 \times 10^3 \text{ m}^{-3}$  (red line), Case (3):  $n_{i_o} = 1.06 \times 10^3 \text{ m}^{-3}$  (green line), and Case 170

- (4):  $n_{i_0} = 1.09 \times 10^3 \text{ m}^{-3}$  (black line), respectively. Various input and initial parameter values are presented in the text.
- 8.5 Spatiotemporal profile of the normalized lowest-order perturbed self-gravitational potential under same condition as figure 8.4. The boundary conditions and input values are given in the text. 172
- 8.6 Spatial profile of the normalized electrostatic (a) Sagdeev potential, and (b) physical potential. Various lines correspond to Case (1):  $m_d = 4.00 \times 10^{-12} \text{ kg}$  (blue line), Case (2):  $m_d = 4.30 \times 10^{-12} \text{ kg}$  (red line), Case (3):  $m_d = 4.60 \times 10^{-12} \text{ kg}$  (green line), and Case (4):  $m_d = 4.90 \times 10^{-12} \text{ kg}$  (black line), respectively. Various input initial values are presented in the text. 173
- 8.7 Spatial profile of the normalized self-gravitational (a) Sagdeev potential and (b) physical potential. Various lines correspond to Case (1):  $n_{i_0} = 6.00 \times 10^4 \text{ m}^{-3}$  (blue line), Case (2):  $n_{i_0} = 6.30 \times 10^4 \text{ m}^{-3}$  (red line), Case (3):  $n_{i_0} = 6.60 \times 10^4 \text{ m}^{-3}$  (green line), and Case (4):  $n_{i_0} = 6.90 \times 10^4 \text{ m}^{-3}$  (black line), respectively. Various input initial values are presented in the text. 174

## **List of abbreviations**

<i>Sl. No</i>	<i>Abbreviation</i>	<i>Full form</i>
1	<i>DMC</i>	<i>Dust Molecular Cloud</i>
2	<i>ISM</i>	<i>Inter-Stellar Medium</i>
3	<i>C-Gs</i>	<i>Carbon-rich Giants</i>
4	<i>O-Gs</i>	<i>Oxygen-rich Giants</i>
5	<i>PN</i>	<i>Planetary Nebulae</i>
6	<i>N</i>	<i>Novae</i>
7	<i>SN</i>	<i>Supernovae</i>
8	<i>IMCs</i>	<i>Interstellar Molecular Clouds</i>
9	<i>GCs</i>	<i>Globular Clouds</i>
10	<i>DCs</i>	<i>Dark Clouds</i>
11	<i>GMCs</i>	<i>Giant Molecular Clouds</i>
12	<i>DDCs</i>	<i>Dense Dust Clouds</i>
13	<i>DDMCs</i>	<i>Diffuse Dust Molecular Clouds</i>
14	<i>CCs</i>	<i>Cirrus Clouds</i>
15	<i>SRCs</i>	<i>Supernova Remnant Clouds</i>
16	<i>eV</i>	<i>electron Volt</i>
17	<i>m-LEE</i>	<i>modified Lane-Emden equation</i>
18	<i>CSB</i>	<i>Cloud Surface Boundary</i>
19	<i>BIS</i>	<i>Bounded Interior Scale</i>
20	<i>UES</i>	<i>Unbounded Exterior Scale</i>
21	<i>ESMs</i>	<i>Electrical Stellar Models</i>
22	<i>TMC1</i>	<i>Taurus Molecular Cloud 1</i>
23	<i>L134N</i>	<i>Lynds 134N</i>
24	<i>KdV</i>	<i>Korteweg-de Vries</i>
25	<i>d-KdV</i>	<i>driven Korteweg-de Vries</i>
26	<i>m-KdVB</i>	<i>modified Korteweg-de Vries Burger</i>
27	<i>d-KdVB</i>	<i>driven Korteweg-de Vries Burger</i>

28	<i>EIT</i>	<i>Extreme-ultraviolet Imaging Telescope</i>
29	<i>SOHO</i>	<i>Solar and Heliospheric Observatory</i>
30	<i>TRACE</i>	<i>Transition Region and Coronal Explorer</i>
31	<i>MHD</i>	<i>Magneto-Hydro-Dynamic</i>
32	<i>GES</i>	<i>Gravito-Electrostatic Sheath</i>
33	<i>SIP</i>	<i>Solar Interior Plasma</i>
34	<i>SWP</i>	<i>Solar Wind Plasma</i>
35	<i>SSB</i>	<i>Solar Surface Boundary</i>
36	<i>ODE</i>	<i>Ordinary Differential Equation</i>
37	<i>tanh-method</i>	<i>Tangent Hyperbolic method</i>
38	<i>RK-IV</i>	<i>Fourth-order Runge-Kutta method</i>
39	<i>FD method</i>	<i>Finite-Difference method</i>
40	<i>GONG</i>	<i>Global Oscillation Network Group</i>
41	<i>SONG</i>	<i>Stellar Observations Network Group</i>
42	<i>HELAS</i>	<i>Helio-and Asteroseismology Network</i>
43	<i>BiSON</i>	<i>Birmingham Solar Oscillations Network</i>
44	<i>IRAS</i>	<i>Infrared Astronomical Satellite</i>
45	<i>ISO</i>	<i>Infrared Space Observatory</i>

## List of symbols

<i>Sl. No</i>	<i>Symbol</i>	<i>Meaning</i>
1	$n_s, m_s, T_s, v_s, v_{ts}$	<i>Number density, mass, temperature, flow velocity and thermal velocity of the <math>s^{\text{th}}</math> species (<math>s = e</math> for the electrons, <math>i</math> for the ions, <math>dc</math> for the charged dust, and <math>dn</math> for the neutral dust)</i>
2	$N_s, M_s$	<i>Normalized population density and flow velocity of the <math>s^{\text{th}}</math> species (<math>s = e</math> for the electrons, <math>i</math> for the ions, <math>dc</math> for the charged dust, and <math>dn</math> for the neutral dust)</i>
3	$n_0$	<i>Equilibrium plasma population density</i>
4	$n_{s0}$	<i>Equilibrium number density of the <math>s^{\text{th}}</math> species (<math>s = e</math> for the electrons, <math>i</math> for the ions, <math>dc</math> for the charged dust, and <math>dn</math> for the neutral dust)</i>
5	$T$ (or, $T_p$ )	<i>Plasma temperature</i>
6	$I_e, I_i$	<i>Electron and ion currents, respectively</i>
7	$\phi, \psi$	<i>Electrostatic and self-gravitational potentials, respectively</i>
8	$\Phi$ (or, $\theta$ )	<i>Normalized electrostatic potential</i>
9	$\Psi$ (or, $\eta$ )	<i>Normalized self-gravitational potential</i>
10	$\tau_{ch}, \tau_{dr}$	<i>Dust charging and dust response time-scales, respectively</i>
11	$F_g, F_e$	<i>Gravitational and electrostatic forces, respectively</i>
12	$M_J, M_{AS}, M_{DMC}$	<i>Jeans mass, stable equilibrium mass limit of Avinash-Shukla model (Avinash-Shukla mass limit) and net mass of the dust molecular cloud, respectively</i>
13	$L_{AS}$	<i>Critical scale-size of Avinash-Shukla mass limit model</i>
14	$R_D$	<i>Dust molecular cloud scale-size</i>
15	$\rho_d, \rho_E$	<i>Mass and electric charge densities, respectively</i>
16	$\Gamma$	<i>Gravito-electrostatic conversion factor</i>
17	$\xi, \tau$	<i>Normalized space and time coordinates, respectively</i>



18	$\lambda_J, \omega_J, \omega_J^{-1}$	<i>Jeans length, Jeans frequency and Jeans time, respectively</i>
19	$C_S, C_{SS}$	<i>Ion acoustic and dust acoustic phase speeds, respectively</i>
20	$\mu$	<i>Normalized Phase velocity of the fluctuations</i>
21	$q_d, Z_d, L_d$	<i>Dust charge, dust charge number and dust scale-size length, respectively</i>
22	$Q_d$	<i>Normalized dust charge</i>
23	$F_{edc}, F_{ed}, F_{idc},$ $F_{id}, F_{cn}, F_{nc}$	<i>Normalized collision frequencies of the electrons and charged grains, electrons and dust grains, ions and charged grains, ions and dust grains, neutral and charged grains, and finally, the charged and neutral grains, respectively</i>
24	$\xi_e, \xi_i$	<i>Electron and ion transit-scale-lengths, respectively</i>
25	$\epsilon_T$	<i>Ion-to-electron temperature ratio</i>
26	$A_{sh}, \Gamma_{sh}, S$	<i>Shock amplitude, shock front thickness and dissipation strength, respectively</i>
27	$\epsilon_0, \mu_0$	<i>Permittivity and permeability of free space, respectively</i>
28	$\Gamma_s$	<i>Polytropic index of the <math>s^{\text{th}}</math> species fluid (with <math>s = i</math> for the ions and <math>s = d</math> for the dust grains)</i>
29	$\eta_i, \eta_d$	<i>Average transit scale-lengths of the ions and dust grains, respectively</i>
30	$V_E, V_G$	<i>Electrostatic and self-gravitational Sagdeev pseudo-potentials, respectively</i>