J/A+A/634/A34 Complete line list and solar values (Baratella+, 2020)

The Gaia-ESO Survey: a new approach to chemically characterising young open clusters.

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Van der Swaelmen M., Roccatagliata V., Gilmore G., Alfaro E.J., Bayo A.,
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Hourihane A., Jeffries R.D., Koposov S.E., Morbidelli L., Prisinzano L.,
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Abstract:

Open clusters are recognised as excellent tracers of the Galactic thin disc properties. At variance with intermediate-age and old open clusters, for which a conspicuous number of studies is now available, until a few years ago clusters younger than 150Myr had been mostly overlooked in terms of their chemical composition (with few exceptions). On the other hand, previous investigations seem to indicate an anomalous behaviour of young clusters, which include (but is not limited to) slightly sub-solar iron (Fe) abundances and extreme, unexpected barium (Ba) enhancements. In a series of papers, we plan to expand our comprehension of this topic and investigate whether these chemical peculiarities are instead related to abundance analysis techniques. We present here a new determination of the atmospheric parameters for 23 dwarf stars observed by the Gaia-ESO survey in five young open clusters (age less than 150Myr) and one star forming region (NGC 2264). We exploit a new method based on titanium (Ti) lines to derive spectroscopic surface gravity and, most important, microturbulence parameter. A combination of Ti and Fe lines have been used to obtain effective temperatures. We also infer abundances of FeI, FeII, TiI, TiII, NaI, MgI, AlI, SiI, CaI, CrI and NiI. Our findings are in fair agreement with Gaia-ESO iDR5 results for effective temperatures and surface gravities, but suggest that for very young stars the microturbulence parameter is over-estimated when Fe lines are employed. This impacts the derived chemical composition, causing the metal content of very young clusters to be under-estimated. Our clusters display a metallicity [Fe/H] between +0.04 and +0.12; thus they are not more metal-poor than the Sun. Although based on a relatively small sample size, our explorative study suggests that we may not need to call for ad hoc explanations to reconcile the chemical composition of young open clusters with Galactic chemical evolution models.

Description:

Line list used in this study (table2.dat), complete of the atomic data, references of the log(gf) values adopted and with equivalent width and abundances measured in the Sun.

File Summary:

FileName	Lrecl	Records	Explanations
ReadMe	80	.	This file
table2.dat	75	229	Complete line list

Byte-by-byte Description of file: table2.dat

Bytes	Format	Units	Label	Explanations
1- 2	A2	---	Element	Element symbol (e.g. Fe)
4- 5	A2	---	Ion	[I II] Ionisation stage (1)
12- 19	F8.3	0.1nm	lambda	Wavelenght
23- 27	F5.3	eV	EP	Excitation potential
31- 36	F6.3	[-]	loggf	Adopted log(gf) values
40- 58	A19	---	r_loggf	Reference code for log(gf) values (2)
62- 67	F6.2	0.1pm	EWsun	Equivalent width measured in the Sun
71- 75	F5.3	---	log(X)sun	Solar abundances (3)

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Note (1): Ionisation stage as follows:
           I  = neutral
           II = singly ionised
Note (2): Reference codes for the log(gf) values correspond to the following
    references:
   GESMCHF             = Froese Fischer & Tachiev (2012, Multiconfiguration
                          Hartree-Fock and Multiconfiguration Dirac-Hartree-Fock
                          Collection, Version 2, http://physics.nist.gov/mchf/)
   1990JQSRT..43..207C = Chang & Tang (1990JQSRT..43..207C)
   1993JPhB...26.4409B = Butler et al. (1993JPhB...26.4409B)
   1995JPhB...28.3485M = Mendoza et al. (1995JPhB...28.3485M)
   GARZ                = Garz (1973A&A....26..471G)
   BL                  = O'Brian & Lawler (1991, Phys. rev. A, 44, 7134)
   K07                 = Kurucz (2007, on-line database of observed and
                          predicted atomic transitions,
                          http://kurucz.harvard.edu/atoms)
   1993PhyS...48..297N = Nahar (1993, Phys. Src. 48, 297)
   SR                  = Smith & Raggett
                          (1981, J. Phys. B: At. Mol. Phys., 14, 4015)
   DIKH                = Drozdowski et al. (1997, Zeitschrift fur Physik D
                          Atoms Molecules Clusters, 41, 125 )
   LGWSC               = Lawler et al. (2013ApJS..205...11L)
   2013ApJS..205...11L = Lawler et al. (2013ApJS..205...11L)
   MFWi                = Martin et al. (1988, Cat. VI/72)
   2013ApJS..208...27W = Wood et al. (2013ApJS..208...27W)
   SLS                 = Sobeck et al. (007, Cat. J/ApJ/667/1267)
   GESHRL14            = Den Hartog et al. (2014, 2014arXiv1409.8142D)
   BKK                 = Bard et al. (1991A&A...248..315B)
   GESB79b             = Blackwell et al. (1979MNRAS.186..657B)
   BWL                 = O'Brian et al. (1991, Journal of the Optical Society
                          of America B Optical Physics, 8, 1185
   GESB82c             = Blackwell et al. (1982MNRAS.199...21B)
   BIPS                = Blacwell, Ibbetson et al. (1979MNRAS.186..633B)
   MRW                 = May et al. (1974A&AS...18..405M)
   2014MNRAS.441.3127R = Ruffoni et al. (2014MNRAS.441.3127R)
   GESB82d             = Blackwell, Petford & Simmons (1982MNRAS.201..595B)
   GESB86              = Blackwell et al. (1986MNRAS.220..289B)
   RU                  = Raassen & Uylings (1998, Cat. J/A+A/340/300)
   2009AA...497..611M  = Melendez & Barbuy (2009A&A...497..611M)
   2003ApJ...584L.107J = Johansson et al. (2003ApJ...584L.107J)
   2014ApJS..211...20W = Wood et al. (2014ApJS..211...20W)
   K08                 = Kurucz (2008, on-line database of observed and
                          predicted atomic transitions,
                          http://kurucz.harvard.edu/atoms) )
   LWST                = Lennard et al. (1975ApJ...197..517L)

   If the reference code contains +, the adopted log(gf) values are the average
    from more sources, while if the code contains ",", it means that the
    gf-value is taken from the first source but then re-normalised to an
    absolute scale using accurate lifetime measurements from the second source.
Note (3): Solar abundances computed with the following atmospheric parameters:
            Teff/logg/xi=5790/4.47/1.00
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(End) Martina Baratella [UniPD], Patricia Vannier [CDS] 10-Jan-2020

*The document above follows the rules of the Standard Description for Astronomical Catalogues; from this documentation it is possible to generate **f77** program to load files into arrays or line by line*