J/A+A/606/A76 The ESO DIBs Large Exploration Survey (Cox+, 2017)

The ESO Diffuse Interstellar Bands Large Exploration Survey (EDIBLES).
I. Project description, survey sample, and quality assessment.

Cox N.L.J., Cami J., Farhang A., Smoker J., Monreal-ibero A., Lallement R., Sarre P.J., Marshall C.C.M., Smith K.T., Evans C.J., Royer P., Linnartz H., Cordiner M.A., Joblin C., van Loon J.T., Foing B.H., Bhatt N.H., Bron E., Elyajouri M., de Koter A., Ehrenfreund P., Javadi A., Kaper L., Khosroshadi H.G., Laverick M., Le Petit F., Mulas G., Roueff E., Salama F., Spaans M.

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=2017A&A...606A..76C (SIMBAD/NED BibCode)

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Keywords: ISM: lines and bands - ISM: clouds - ISM: molecules - dust, extinction - stars: early-type - local interstellar matter

Abstract:

The carriers of the diffuse interstellar bands (DIBs) are largely unidentified molecules ubiquitously present in the interstellar medium (ISM). After decades of study, two strong and possibly three weak near-infrared DIBs have recently been attributed to the C^+_{60} fullerene based on observational and laboratory measurements. There is great promise for the identification of the over 400 other known DIBs, as this result could provide chemical hints towards other possible carriers. In an effort to systematically study the properties of the DIB carriers, we have initiated a new large-scale observational survey: the ESO Diffuse Interstellar Bands Large Exploration Survey (EDIBLES). The main objective is to build on and extend existing DIB surveys to make a major step forward in characterising the physical and chemical conditions for a statistically significant sample of interstellar lines-of-sight, with the goal to reverse-engineer key molecular properties of the DIB carriers. EDIBLES is a filler Large Programme using the Ultraviolet and Visual Echelle Spectrograph at the Very Large Telescope at Paranal, Chile. It is designed to provide an observationally unbiased view of the presence and behaviour of the DIBs towards early-spectral-type stars whose lines-of-sight probe the diffuse-to-translucent ISM. Such a complete dataset will provide a deep census of the atomic and molecular content, physical conditions, chemical abundances and elemental depletion levels for each sightline. Achieving these goals requires a homogeneous set of high-quality data in terms of resolution (R~70000-100000), sensitivity (S/N up to 1000 per resolution element), and spectral coverage (305-1042nm), as well as a large sample size (100+ sightlines). In this first paper the goals, objectives and methodology of the EDIBLES programme are described and an initial assessment of the data is provided.

Description:

We constructed a statistically representative survey sample that probes a wide range of interstellar environment parameters including reddening E(B-V), visual extinction A_V, total-to-selective extinction ratio R_V, and molecular hydrogen fraction f_{H2}.

EDIBLES provides the community with optical (~305-1042nm) spectra at high spectral resolution (R~70000 in the blue arm and 100000 in the red arm) and high signal-to-noise (S/N; median value ~500-1000), for a statistically significant sample of interstellar sightlines. Many of the >100 sightlines included in the survey already have auxiliary available ultraviolet, infrared and/or polarisation data on the dust and gas components.

File Summary:

FileName	Lrecl	Records	Explanations
ReadMe	80	.	This file
tablea1.dat	96	96	Targets observed for EDIBLES
tablea2.dat	96	18	Observations planned to complete the EDIBLES sample

Byte-by-byte Description of file: tablea1.dat tablea2.dat

Bytes	Format	Units	Label	Explanations
1- 9	A9	---	Name	Star name
11- 12	I2	h	RAh	Right ascension (J2000)

14- 15	I2	min	RAm	Right ascension (J2000)
17- 20	F4.1	s	RAs	Right ascension (J2000)
22	A1	---	DE-	Declination sign (J2000)
23- 24	I2	deg	DEd	Declination (J2000)
26- 27	I2	arcmin	DEm	Declination (J2000)
29- 32	F4.1	arcsec	DEs	Declination (J2000)
34- 56	A23	---	SpType	MK spectral type
58- 60	A3	---	r_SpType	Reference for spectral type (1)
62- 65	F4.2	mag	E(B-V)	?=- Interstellar reddenning (2)
67- 70	F4.2	---	RV	?=- Total-to-selective extinction ratio
72- 75	F4.2	mag	AV	?=- Visual extinction
77- 79	A3	---	r_AV	Reference for AV (1)
81- 85	F5.2	[cm-2]	logNHI	?=- HI column density (3)
87- 91	F5.2	[cm-2]	logNH2	?=- H_2 column density (3)
93- 96	F4.2	---	fH2	?=- Molecular hydrogen fraction

Note (1): References as follows:
A69 = Abt & Morgan, 1969AJ.....74..813A
C69 = Cowley et al., 1969AJ.....74..375C
E05 = Evans et al., 2005R, Cat. J/A+A/437/467
F57 = Feast et al., 1957MmRAS..68....1F
G01 = Gray et al., 2001, Cat. J/AJ/121/2148
G68 = Guetter, 1968PASP...80..197G
G77 = Garrison et al., 1977ApJS...35..111G
G94 = Garrison & Gray, 1994, Cat. J/AJ/107/1556
H13 = Holberg et al., 2013, Cat. J/MNRAS/435/2077
H56 = Hiltner, 1956, Cat. J/ApJS/2/389
H69 = Hiltner et al., 1969ApJ...157..313H
H73 = Humphreys, 1973A&AS....9...85H
H78 = Houk, 1978, Cat. III/51
H82 = Hendry, 1982PASP...94..169H
L06 = Levenhagen & Leister 2006)
L68 = Lesh, 1968ApJS...17..371L, Cat. III/23
L75 = Levato, 1975A&AS...19...91L
L76 = Levato & Abt, 1976PASP...88..712L
M50 = Morgan & Roman, 1950ApJ...112..362M
M55 = Morgan et al., 1955ApJS....2...41M
M73 = Morgan & Keenan, 1973ARA&A..11...29M
M95 = Massey et al., 1995, Cat. J/ApJ/454/151
O59 = Osawa, 1959ApJ...130..159O
P98 = Parsons & Ake, 1998, Cat. J/ApJS/119/83
R09 = Renson & Manfroid, 2009A&A...498..961R, Cat. III/260
S11 = Sota et al., 2011ApJS..193...24S, Cat. III/274
S14 = Sota et al., 2014ApJS..211...10S, Cat. III/274
S52 = Sharpless, 1952ApJ...116..251S
S56 = Stebbins & Kron, 1956ApJ...123..440S, classification originally
from W. W. Morgan
S71 = Schild & Chaffee, 1971ApJ...169..529S
S99 = Steele et al., 1999A&AS..137..147S
V04 = Valencic et al., 2004ApJ...616..912V),
Fitzpatrick & Massa (2007, Cat. J/ApJ/663/320)
W03 = Wegner, 2003, Cat. J/AN/324/219
W71 = Walborn, 1971ApJS...23..257W
W76 = Walborn, 1976ApJ...205..419W
Note (2): The interstellar reddening, E(B-V), was computed from (B-V)J colours
(taking the average from Tycho-2 and Simbad B-V colours; where Tycho-2 colours
were converted to Johnson colours; Mamajek et al. (2002, Cat. J/AJ/124/1670)
and the published spectral classifications, adopting intrinsic colours from
Fitzgerald (1970A&A.....4..234F).
Note (3): From Jenkins (2009, Cat. J/ApJ/700/1299).

History:
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