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All-sky catalogs and analysis of interstellar clouds

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Abstract. All available databases of molecular and gas-dust clouds in the Galaxy and other galaxies including their main properties such as position, angular and linear dimensions, distances, radial velocities, atomic and molecular hydrogen mass and column densities, temperatures, masses and others available are briefly described in the paper. An initial list of about 10 000 entries was condensed into a cross-identified all-sky catalogue containing molecular and gas-dust clouds. Some relationships were studied between main physical features of clouds. Finally, we prepared the complex observing program and address prospective work for gaining the gaps.

Keywords. Galaxy: structure, Galaxy: disk, Galaxy: kinematics and dynamics, ISM: structure, ISM: clouds, galaxies: structure, galaxies: ISM, surveys, catalogs

1. Introduction

Impressive instrumental progress in recent years has provided possibilities to careful study the interstellar medium (ISM) in the Galaxy (Kirk et al 2006,Vazquez et al 2008, Heyer *et al.*2009, Roman-Duval et al 2009, Azimlu & Fich 2011 ,Draine 2011,and many others) and in the nearest and more distant galaxies such as LMC, SMC, M31, M51, M83 etc.(Taylor et al 2000, Mizuno et al 2001,Engargiola et al 2003,Rosolowsky et al 2007,Bolatto et al 2008,Pineda et al 2009,Muraoka et al 2009, Fukui et al 2009, Gratier et al 2012,Buchbender et al 2013,Colombo et al 2014, Kirk et al 2015, etc.). Significant enough baryon mass of the galactic and extragalactic ISM is concentrated in the clouds with molecular content in the densest parts. The molecular clouds (MoC) with closely related cold dust-gas clouds, particularly HI ones, should play a key-role in the star forming processes as well as in the dynamics of the Galaxy. These arguments show the importance of counting and surveying of the MoC populations.

2. Results and implications

Aiming to solve at least some problems of the physics and evolution of the MoC system in the Galaxy (as well as in other galaxies), its impact on the dynamics and evolution of the Galaxy itself, and to extend the results to the MoC systems in other galaxies we drafted a consolidated composite catalog of molecular and dust-gas clouds based on the recent data. Online data banks and services such as VizieR, SIMBAD at CDS as well as original publications were used. In our Galaxy there are about 50 giant and 200 large molecular clouds, more than 2500 smaller cold dark clouds (including clumps and cores this value exceeds approximately 5000 objects) observed in 11 kpc Solar neighborhood. More than 5500 giant MoC were found in 7 Local Group galaxies and 11 more distant ones. The general catalog for the Galaxy has been divided into 3 sub-catalogs: 1)large and giant MoC; 2) MoC with moderate masses and sizes; 3) small MoC including the clumps and cores. All main catalogs and sub-catalogs contain the coordinates, sizes, distances, masses and other physical parameters (density, temperature, radial velocity, etc.) that are available for the different clouds. Statistical and correlation analyses of the data has been performed, the spatial distribution is drawn and the total number is estimated, the dynamic model of formation and evolution of MoC system is proposed. Our results are compared

and analysed with the data of other investigations as well as the ways to complete and improve the catalog data are also proposed. We prepared the complex program for further observations of MoC using the Suffa radio telescope, one of the band-passes of which will cover 230GHz or CO(2-1) line emission at 1.3mm, and other large facilities to fill the gaps in observed physical parameters of MoC.

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