The Cool Galactic ISM: Zooming in on the Physical Processes Driving Star-Formation and Galactic Evolution

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The ISM is a complex, multi-phase turbulent medium that plays a key role in galaxy evolution, with a multitude of physical processes affecting galaxies between stellar and galactic scales. The Galactic ISM provides us with a detailed lens on these physical processes. In this lecture, I will review the physical processes determining the different phases of the ISM. I will focus on the cold neutral phase, which gives rise to molecular clouds and the formation of stars. I will review the state-of-the-art observational knowledge about molecular clouds, their formation mechanisms from atomic clouds, their properties, and location in the Milky Way, and the major questions left open in the field. I will then review the observational and numerical knowledge foundation on the turbulent properties of interstellar gas, and how turbulence in the ISM plays a key role in star-formation. Finally, I will go over recent advancements in our understanding of the star-formation process in the Milky Way, which complements observations of star-formation in other galaxies.