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Presentation Title: WYSINWYG: proto-planetary disc physical and observed radii are different

Work Package: WP116 310 Protoplanetary Disc Models

Proto-planetary disc surveys conducted with ALMA are measuring disc radii in multiple star forming regions. The disc radius is a fundamental quantity to diagnose whether discs undergo viscous spreading, discriminating between viscosity or angular momentum removal by winds as drivers of disc evolution. However, the most accessible observational tracer, dust continuum emission, is also affected by radial drift, complicating the picture; in addition observations measure surface brightness and not surface density. These effects must be quantified if we want to use measured radii to make inferences about disc evolution. In this talk I will show, using theoretical models of dust grain growth and radial drift, how the radii of dusty viscous proto-planetary discs evolve with time. I will show that, despite radial drift, the radius enclosing most of the dust mass increases with time, closely following the evolution of the gas radius. In contrast, I predict tcolin

at with the sensitivity of the current surveys the observed radii, defined as those enclosing, e.g., 68 per cent of the disc sub-mm flux, decrease with time, because the grains in the outer part of the disc are small and have a low sub-mm opacity. To overcome this problem, observing the expansion of the dust disc requires using definitions based on high fractions of the disc flux (e.g. 95 per cent) and very long integrations with ALMA.