

Abstract Submitted  
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**Time-dependent flow fields around the spherical colonial alga *Volvox carteri*** DOUGLAS BRUMLEY, MARCO POLIN, CONSTANT MOREZ, RAYMOND GOLDSTEIN, TIMOTHY PEDLEY, DAMTP, University of Cambridge — *Volvox carteri* is a spherical colonial alga, consisting of thousands of biflagellate cells. The somatic cells embedded on the surface of the colony beat their flagella approximately towards the south pole, producing a net fluid motion. Using high-speed imaging and particle image velocimetry (PIV) we have been able to accurately analyse the time-dependent flow fields around such colonies. The somatic cells on the colony surface may beat their flagella in a perfectly synchronised fashion, or may exhibit behaviour in which the coordination wanders periodically between forward and backward propagating metachronal waves. We analyse the dependence of this synchronisation on fundamental parameters in the system such as colony radius, characterise the speed and wavelength of metachronal waves propagating on the surface, and investigate the extent to which hydrodynamic interactions are responsible for the exhibited behaviour. The time-averaged flow fields agree with previous experiments involving freely swimming colonies (Phys. Rev. Lett. 105:168101, 2010) and Blake's squirmer model (J. Fluid Mech. 46, 199-208, 1971b).

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