

Fig.1. Distribution of the collected data against the [Hewitt and Roberts \(1969\)](#) flow patterns map

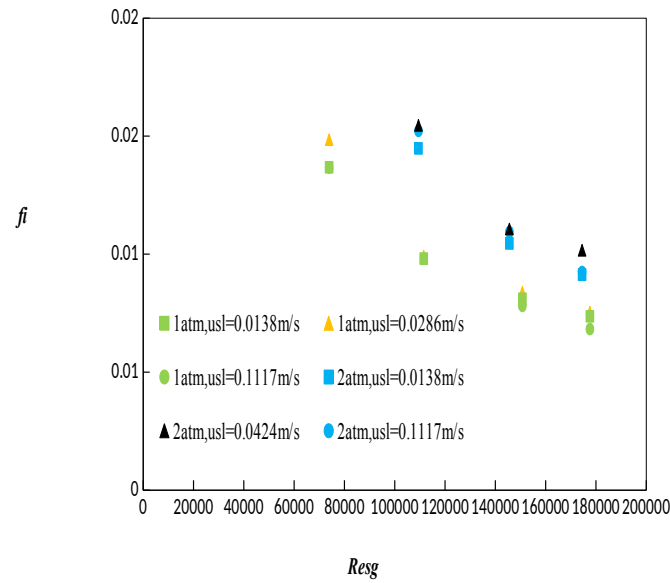


Fig. 2. The variation of the interfacial friction factors with superficial gas Reynolds number

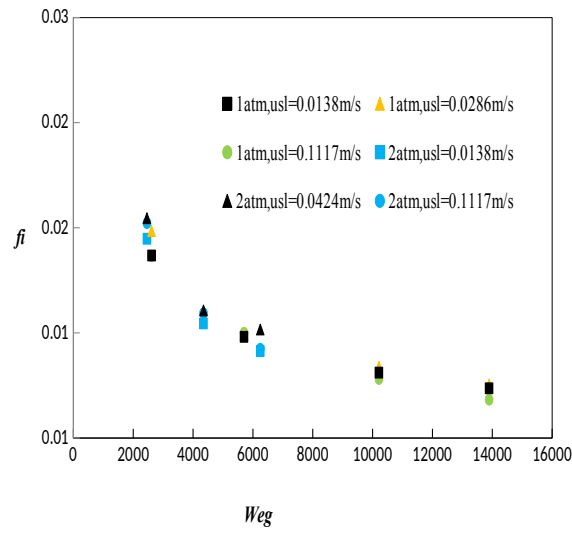
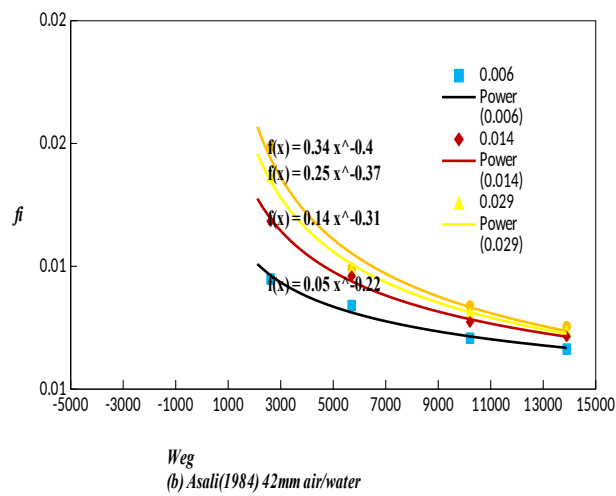
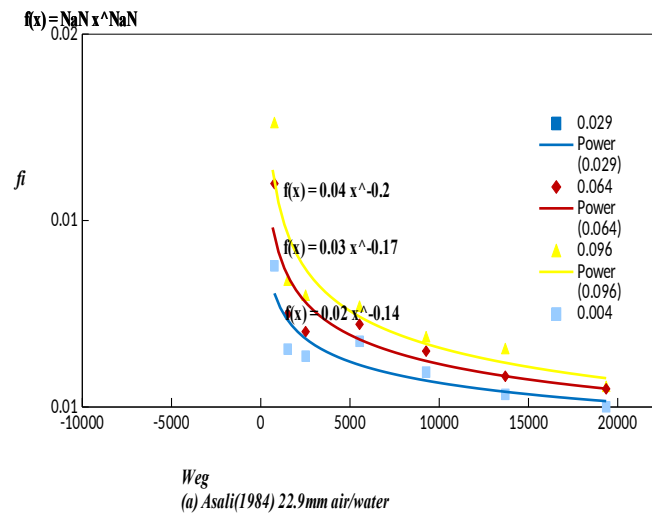


Fig. 3. The variation of the interfacial friction factors with the modified Weber number



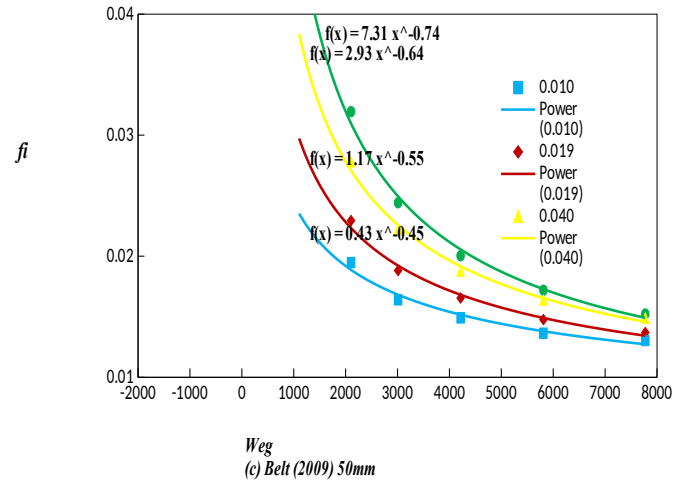


Fig. 4. The variation of the interfacial friction factors with the modified Weber number for different superficial liquid velocity

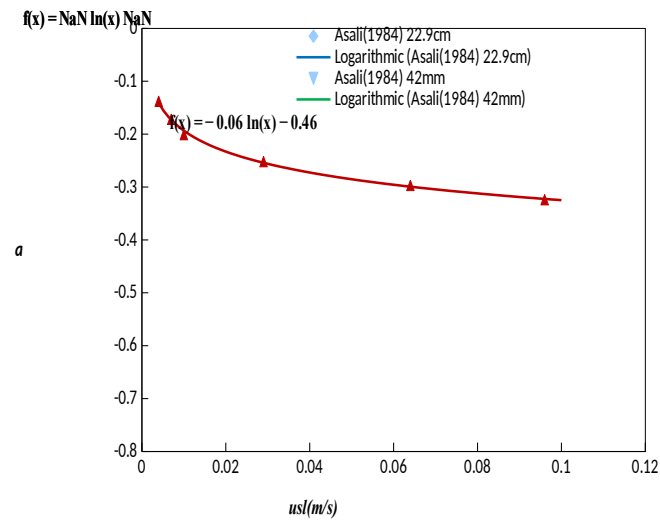


Fig. 5. The power law index versus superficial liquid velocity

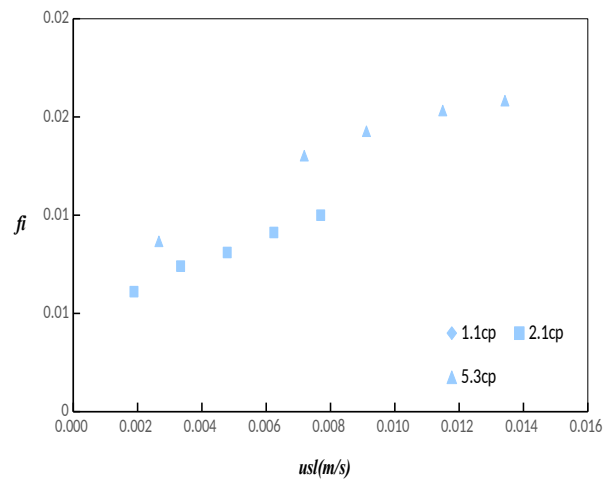
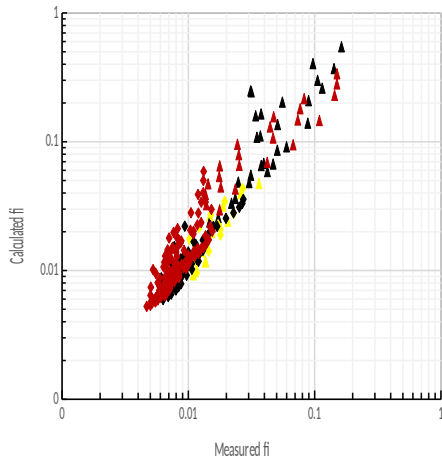
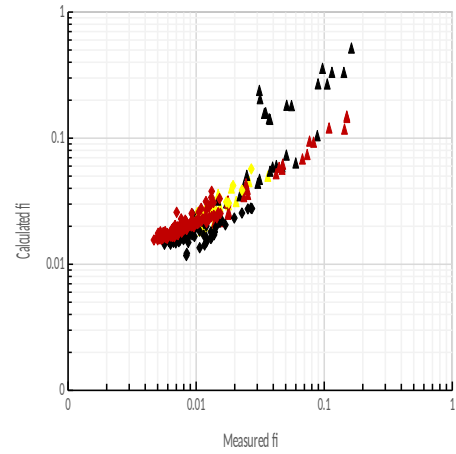


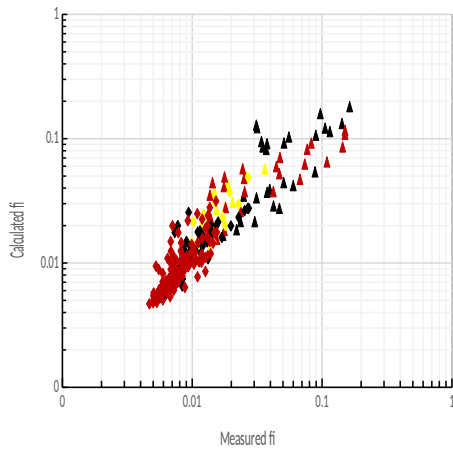
Fig. 6. Viscosity effect on interfacial friction factor at $u_{sg}=30\text{m/s}$



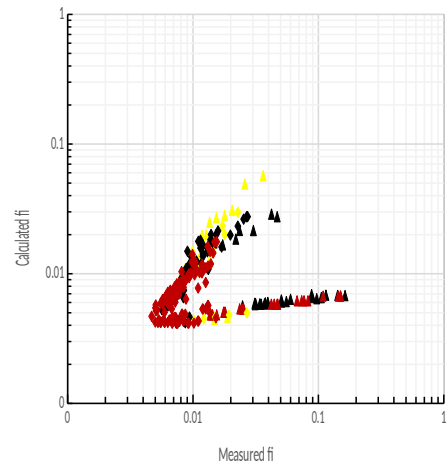
(a) Henstock & Hanratty 1976



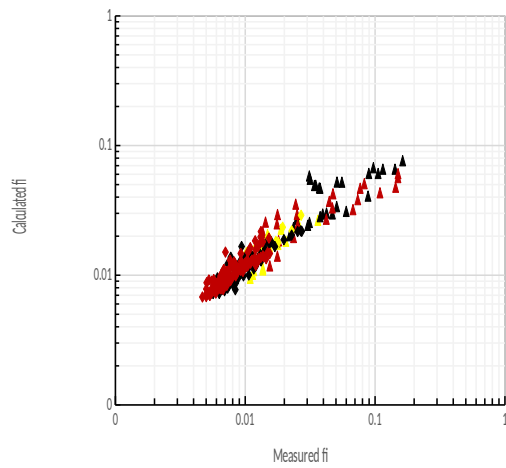
(b) Fukano & Furukawa 1998



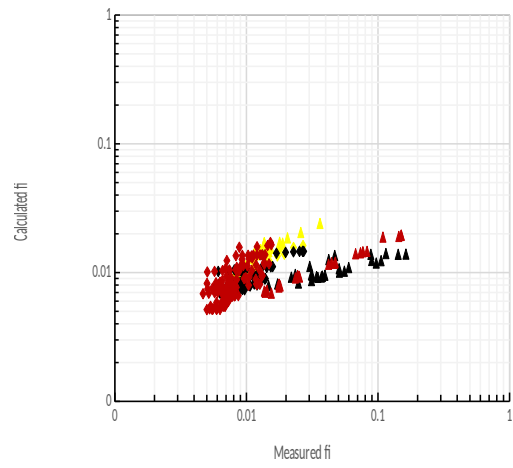
(c) Ambrosini et al 1991



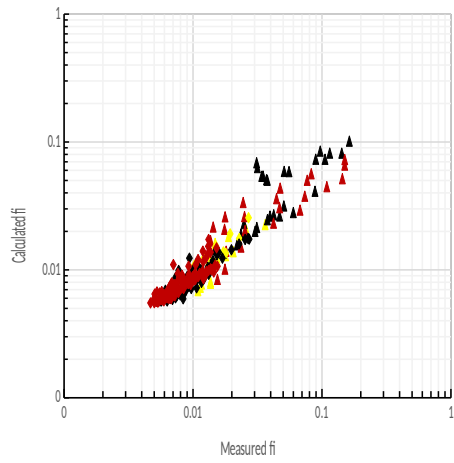
(d) Holt 1999



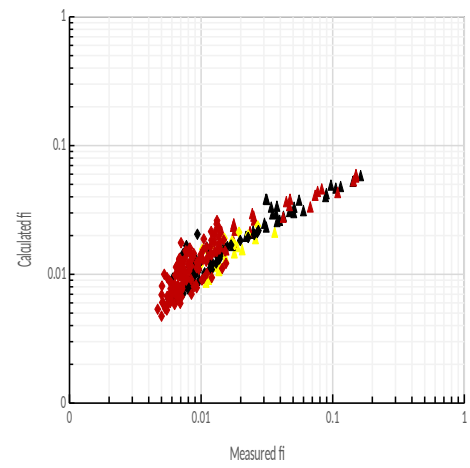
(e) Wallis 1969



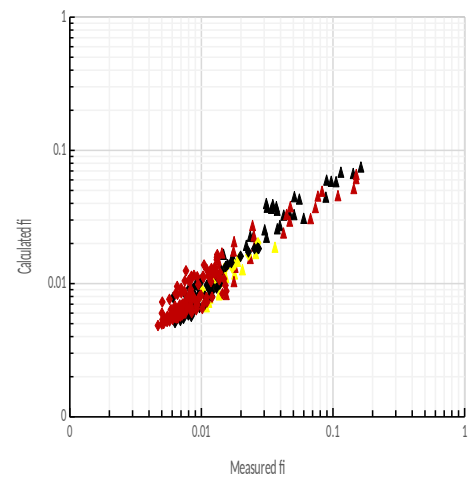
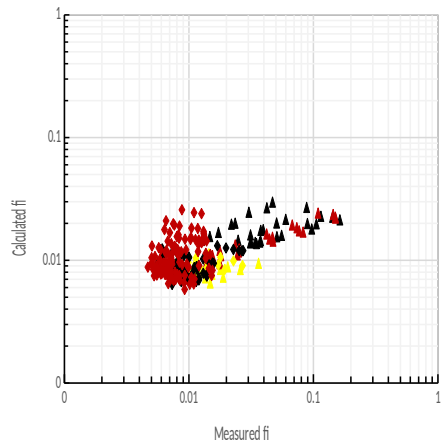
(f) Aliyu et al 2017



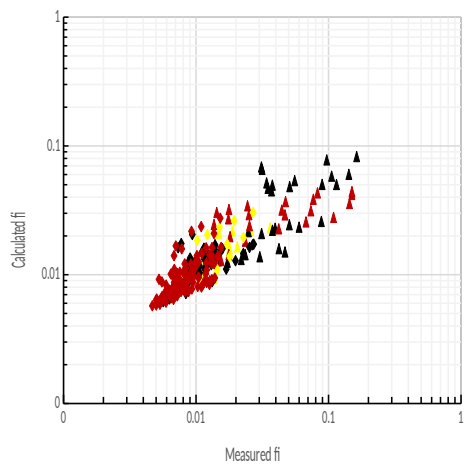
(g) Moeck 1970



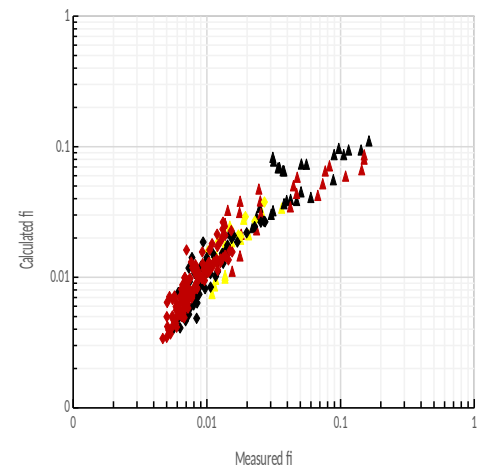
(h) Hori 1976



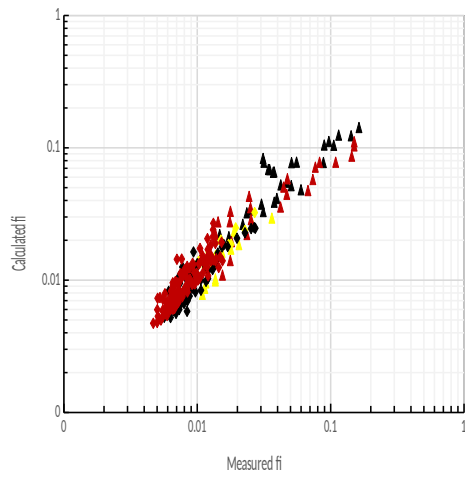
(j) Whalley & Hewitt 1978



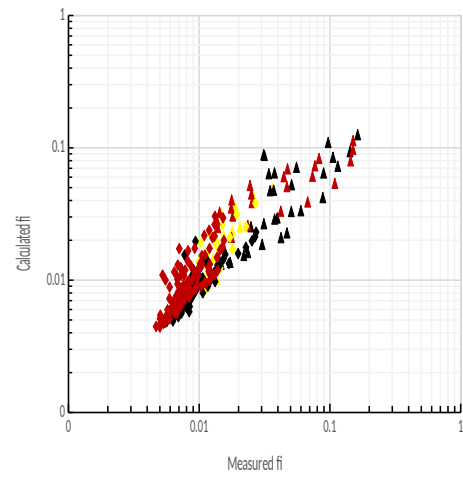
(k) Klausner & Chao 1991



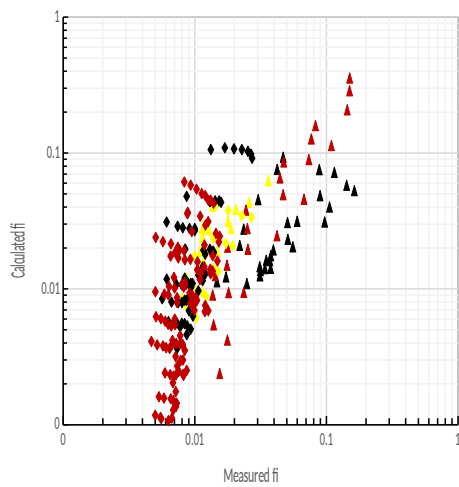
(l) Belt et al 2009



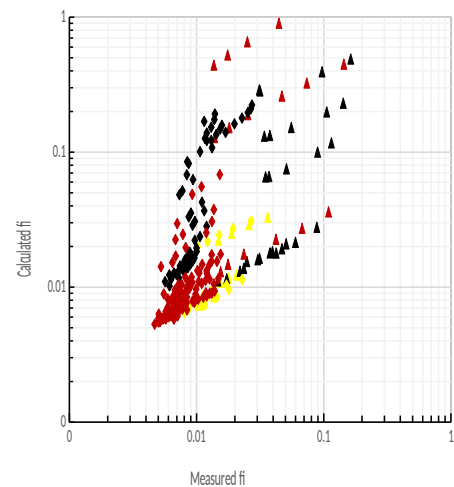
(m) Fore et al 2000



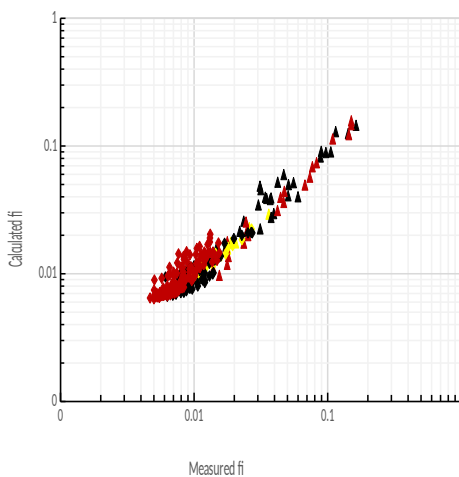
(n) Asali et al 1985



(o) Aliyu et al 2015



(p) Fukano et al 1991



- Fore & Dukler(1995) 50.8mm air/water
- Fore & Dukler(1995) 50.8mm air/50%glycerine
- Aliyu(2017) 101.6mm
- Skopich et al(2015) 50.8,101.6mm
- Shearer & Nedderman(1967) 16,32mm
- Wolf(2001) 31.8mm
- ◆ Asali(1984) 42,22.9mm air/water
- ◇ Asali(1984) 42mm air/water-glycerine
- ◆ Belt et al (2009) 50mm
- ▲ Fukano & Furukawa(1997) 26mm air/water-glycerol
- △ Kaji & Azzopardi(2010) 19mm
- ▲ Zabarar (1986) 50.8mm

Fig. 7. Comparison of interfacial friction factor data points with predictions of various correlations