From Parsons *et al* 2012:

$$\Delta_N^2(k) \propto (k)^{\frac{5}{2}} \left[\frac{1}{B}\right]^{\frac{1}{2}} \left[\frac{1}{\Delta \ln k}\right]^{\frac{1}{2}} \Omega T_{sys}^2 \left[\frac{1}{t_{per\_day}}\right]^{\frac{1}{2}} \left[\frac{1}{t_{cam}}\right] \left[\frac{1}{N_a}\right] \left[\frac{f_o}{f}\right]^{\frac{1}{2}} \tag{1}$$

where k is the magnitude of the k-mode, B is the bandwidth, $\Delta \ln k$ is the log of the binsize, Ω is the field-of-view, T_{sys} is the system temperature, t_per_day is the number of hours observed per day, t_{cam} is the number of days observed, N_a is the number of antennas, and f_o/f is a configuration metric for a redundant array as therein defined.

Pulling out terms relating to diameter (D_a) and number, we can write Eq. 1 as

$$\Delta_N^2(k) \propto \frac{\Omega\sqrt{f_o/f}}{N_a\sqrt{t_{per\_day}}} \propto \frac{(1/D_a^2)(1/\sqrt{N_a})}{N_a\sqrt{D_a}} = \frac{1}{D_a^{\frac{5}{2}} N_a^{\frac{3}{2}}} \tag{2}$$

where the dependencies on diameter and number have been substituted in, noting that the expressions for f_o/f and t_per_day were derived in Parsons et al where the baselines for the close-packed array are multiples of the diameter.

From Mellema *et al* 2013:

$$\Delta_N^2(k) \propto k^{\frac{3}{2}} \sqrt{D_c^2 \Delta D_c \Omega_{FOV}} \left[\frac{T_{sys}}{\sqrt{B t_{int}}}\right]^2 \left[\frac{A_{core}A_{eff}}{A_{coll}^2}\right] \tag{3}$$

Pulling out similar D_a and number terms:

$$\Delta_N^2(k) \propto \sqrt{\Omega} \left[\frac{1}{t_{int}}\right] \left[\frac{A_{core}A_{eff}}{A_{coll}^2}\right] \propto \left[\frac{1}{D_a}\right] \left[\frac{1}{t_{int}}\right] \left[\frac{(ND_a^2)(D_a^2)}{(ND_a^2)^2}\right] = \frac{1}{t_{int}} \frac{1}{ND_a^2} \tag{4}$$

where, for hex packing

$$A_{core} \propto \left[\frac{4N-1}{3} D_a^2\right] \sim ND_a^2 \tag{5}$$

So, there is a factor of $\sqrt{ND_a}$ different. Allowing for incoherent drift-scanning, $t_{int} \rightarrow \sqrt{t_{int}} \sim 1/\sqrt{D_a}$, so we are left with a $\sqrt{N}$ different, probably related to the specifics of f_o/f and/or $A_{core}/A_{coll}^2 \cdots$

Running Jonnie's code for

- a bunch of diameters with 331 antennas (7-21 m)
- a bunch of elements for 14-m diameter (37-919)

and evaluate at ks = 1, yields:

$$\Delta_N^2(1) \approx \frac{1}{D^{1.5} N^{1.5}} \tag{6}$$

The exact coefficient is weakly dependent on the k-value in the middle k values. The power laws fit better for larger k's (and are closer to 1.5).