Find the projection of the vector $\mathbf{v} = -2\mathbf{j} + 2\mathbf{k}$ onto $\mathbf{u} = \mathbf{i} + \mathbf{j} + 4\mathbf{k}$. [99中山機電III 1 (a)]

[解] $(\mathbf{v} \cdot \frac{\mathbf{u}}{|\mathbf{u}|}) \frac{\mathbf{u}}{|\mathbf{u}|} = [(-2\mathbf{j} + 2\mathbf{k}) \cdot \frac{\mathbf{i} + \mathbf{j} + 4\mathbf{k}}{\sqrt{1^2 + 1^2 + 4^2}}] \frac{\mathbf{i} + \mathbf{j} + 4\mathbf{k}}{\sqrt{1^2 + 1^2 + 4^2}} = \frac{(-2 + 8)(\mathbf{i} + \mathbf{j} + 4\mathbf{k})}{18} = \frac{\mathbf{i} + \mathbf{j} + 4\mathbf{k}}{3}$