

---

# Post\_Process\_CF

## Table of Contents

Constants .....	1
Extract Necessary Parameters .....	1
Calculate Total Energy, Euler Angles, and Attitude Constraint .....	1

Written by Garrett Ailts

## Constants

```
day2sec = 86400;
```

## Extract Necessary Parameters

```
mag_epoch = params.Earth.mag_epoch;
start_epoch = params.sc.start_epoch;
R = params.Earth.Rmean;
```

## Calculate Total Energy, Euler Angles, and Attitude Constraint

```
xout = xout';
E = zeros(1,length(tout));
eulerAngs = zeros(3,length(tout));
eulerEstErr_CF = zeros(3,length(tout));
constraint = zeros(1,length(tout));
constrainthat = zeros(1,length(tout));
q = zeros(4,length(tout));
h = zeros(1,length(tout));

I3 = [0 0 1]';
for lv1 = 1:length(tout)
    r = norm(xout(1:3,lv1));
    telapsed = tout(lv1)+day2sec*(start_epoch-mag_epoch);
    h(lv1) = norm(r)-R;
    ba = EarthMagField(xout(1:3,lv1),telapsed);
    if strcmp(AttType,'DCM')
        Cba = reshape(xout(7:15,lv1),[3 3]);
        q(:,lv1) = DCM2Quat(Cba);
        Cea_CF = reshape(xout(19:27,lv1),[3 3]);
        constraint(lv1) = det(Cba)-1;
        constrainthat(lv1) = det(Cea_CF)-1;
    else
        Cba = Quat2DCM(xout(7:10,lv1));
        Cea_CF = Quat2DCM(xout(14:17,lv1));
```

```
        constraint(lv1) =  
xout(7:9,lv1) '*xout(7:9,lv1)+xout(10,lv1)^2-1;  
        constrainthat(lv1) = xout(14:16,lv1) '*xout(14:16,lv1)+ ...  
  
xout(17,lv1)^2-1;  
    end  
  
    E(lv1) = Etot(xout(:,lv1),r,Cba,ba,params);  
    [phi, theta, psi] = DCM2Euler321(Cba);  
    Ceb_CF = Cea_CF*Cba'; % error DCM between estimated frame and body  
frame  
    [phierr_CF, thetaerr_CF, psierr_CF] = DCM2Euler321(Ceb_CF);  
    eulerAngs(:,lv1) = [phi; theta; psi];  
    eulerEstErr_CF(:,lv1) = [phierr_CF; thetaerr_CF; psierr_CF];  
end  
if strcmp(AttType,'DCM')  
    wba = xout(16:18,:);  
else  
    q = xout(7:10,:);  
    wba = xout(11:13,:);  
end
```

*Published with MATLAB® R2019b*