STAN	BRMS

parameters {
  real mu_a_sp;
  real mu_b_force_sp;
  real mu_b_photo_sp;
  real mu_b_chill_sp;
  real mu_b_cf_sp;
  real mu_b_cp_sp;
  real mu_b_fp_sp;
  real<lower=0> sigma_a_sp;
  real<lower=0> sigma_b_force_sp;
  real<lower=0> sigma_b_photo_sp;
  real<lower=0> sigma_b_chill_sp;
  real<lower=0> sigma_b_cf_sp;
  real<lower=0> sigma_b_cp_sp;
  real<lower=0> sigma_b_fp_sp;
  real<lower=0> sigma_y;
 	
  real a_sp[n_sp]; // intercept for species
  real b_force[n_sp]; // slope of forcing effect
  real b_photo[n_sp]; // slope of photoperiod effect
  real b_chill[n_sp]; // slope of chill effect
  real b_cf[n_sp]; // slope of chill x force effect
  real b_cp[n_sp]; // slope of chill x photo effect
  real b_fp[n_sp]; // slope of force x photo effect
 	
}
	parameters {
	  vector[Kc] b; // population-level effects
	  real temp_Intercept; // temporary intercept
	  real<lower=0> sigma; // residual SD
	  vector<lower=0>[M_1] sd_1; // group-level standard deviations
	  matrix[M_1, N_1] z_1; // unscaled group-level effects
	  // cholesky factor of correlation matrix
	  cholesky_factor_corr[M_1] L_1;
	}

transformed parameters {
  real yhat[N];
  for(i in 1:N){
  yhat[i] = a_sp[sp[i]] + // indexed with species
  b_force[sp[i]] * force[i] +
  b_photo[sp[i]] * photo[i] +
  b_chill[sp[i]] * chill[i] +
	transformed parameters {
	  // group-level effects
	  matrix[N_1, M_1] r_1 = (diag_pre_multiply(sd_1, L_1) * z_1)';
	  vector[N_1] r_1_1 = r_1[, 1];
	  vector[N_1] r_1_2 = r_1[, 2];
	  vector[N_1] r_1_3 = r_1[, 3];
	  vector[N_1] r_1_4 = r_1[, 4];
	}

```
                b_cf[sp[i]] *
inter_cf[i] +
                b_cp[sp[i]] *
inter_cp[i] +
                b_fp[sp[i]] *
inter_fp[i];
                }
}
```

```
generated quantities {
  // actual population-level intercept
  real b_Intercept = temp_Intercept -
dot_product(means_X, b);
  corr_matrix[M_1] Cor_1 =
multiply_lower_tri_self_transpose(L_1);
  vector<lower=-1,upper=1>[NC_1] cor_1;
  // take only relevant parts of correlation
matrix
  cor_1[1] = Cor_1[1,2];
  cor_1[2] = Cor_1[1,3];
  cor_1[3] = Cor_1[2,3];
  cor_1[4] = Cor_1[1,4];
  cor_1[5] = Cor_1[2,4];
  cor_1[6] = Cor_1[3,4];
}
```